Distribution and Status of Bird, Small Mammal, Reptile, and Amphibian Species, South Dakota Field Office-BLM

Prepared for:

Bureau of Land Management
South Dakota Field Office

Prepared by:

Daniel A. Bachen and Bryce A. Maxell

Montana Natural Heritage Program
a cooperative program of the
Montana State Library and the University of Montana

November 2014

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Agreement Number:

L13AC00190

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This document should be cited as follows:

Bachen, D. A, and B. A. Maxell. 2014. Distribution and status of bird, small mammal, reptile, and amphibian species, South Dakota Field Office-BLM. Report to the Bureau of Land Management, South Dakota Field Office. Montana Natural Heritage Program, Helena, Montana 25 pp. plus appendices.

EXECUTIVE SUMMARY

To date, federal lands administered by the Bureau of Land Management (BLM) in South Dakota have received limited attention for baseline inventories of nongame species including bird, terrestrial small mammal, bat, amphibian and reptile species. Documenting baselines for distribution, habitat association, and relative status of these species, particularly species listed as Sensitive by the BLM or rare, threatened, or endangered by the state, can aid in conservation of these species. To address this need we conducted structured surveys to document these species within BLM administered lands in western South Dakota, using point count surveys for birds, trap arrays for small mammals, passive acoustic bat detectors for bats, night time calling surveys for amphibians, and visual encounter surveys of wetlands for amphibians and reptiles.

Using structured surveys over the spring and summer of 2014, we documented 100 bird species, including 13 listed as Sensitive by the BLM, 15 terrestrial small mammal species, 6 bat species, and 5 amphibian species, including 2 Sensitive species. While conducting this work we also incidentally recorded 1,260 additional animal observations, including an additional 25 bird species, 17 mammal species, and 8 reptile species. While conducting surveys for birds we documented several BLM Sensitive species of note, including the Sprague's Pipit (*Anthus spragueii*), Blue-Gray Gnatcatcher (*Polioptila caerulea*), Bald Eagle (*Haliaeetus leucocephalus*), and Baird's Sparrow (*Ammodramus bairdii*). Although we did not capture any Sensitive small mammal species, we did capture 2 species of shrew that represent significant records for the state. In central South Dakota we captured a Least Shrew (*Cryptotis parva*), which not only was the first record of the species in Stanley County, but also is one of the northern most observations of this specie in the state (Backlund 2002). In Northwest South Dakota we captured a shrew in sagebrush steppe that is likely a range extension for Montane Shrew (*Sorex monticolus*) or Dwarf Shrew (*S. nanus*), but are still working on definitive identification of this specimen. Although we documented several amphibian and reptile species listed as Sensitive, we documented one particularly rare species. In a small area of badlands in Western Butte County we incidentally encountered a Greater Short-horned Lizard (*Phrynosoma hernandesi*). In this area we also documented other rare species like the Sage Thrasher (*Oreoscoptes montanus*) and Brewer's Sparrow (*Spizella breweri*).

For birds, we found the highest species diversity in Central South Dakota, where the prairie transitions to conifer forests, and the lowest species diversity within the conifer forests of the Black Hills, although this low diversity may reflect inclement weather conditions at the time of the survey. For small terrestrial mammals, we found the greatest species diversity in the conifer forests of the Black Hills and the lowest species diversity in the mixedgrass prairies of west central South Dakota. For bats, we found a cessation of activity at all five of our prairie dominated monitoring sites between December 2013 and March 2014. For amphibians, we detected the highest diversity of species in the mixedgrass prairies of central South Dakota in close proximity to the Belle Fourche River and the

lowest species diversity in mixedgrass prairie in west central South Dakota.

Overall, we found riparian woodland habitats to be extremely limited on BLM lands within the South Dakota BLM Field Office with some evidence of lack of regeneration of Plains Cottonwoods. We encourage management focus on this habitat to conserve existing riparian woodlands and restore riparian woodland areas that are becoming deforested by promoting management regimes that mimic the natural frequency and intensity of disturbances resulting from historical grazing, fire, and flood regimes. More broadly, management regimes that mimic the natural frequency and intensity of disturbances to all major habitat cover types should be encouraged across the South Dakota BLM Field Office.

In order to make survey and detection information from this and other surveys more readily available for resource management plans and project-level planning, we have made it available online through the Montana Natural Heritage Program's MapViewer http://mtnhp.org/mapviewer/

ACKNOWLEDGEMENTS

We extend considerable thanks and appreciation to Rebecca Newton, wildlife biologist with the BLM South Dakota Field Office, for recognizing the importance of this project and shepherding the project through BLM channels. Thanks to Scott Blum, Braden Burkholder, and Shannon Hilty for analyzing bat calls, Scott Blum for appending the data to the Montana Natural Heritage Program's central animal observation database, and Paul Hendricks for originally proposing the project. Also we acknowledge and thank the South Dakota Game and Fish for allowing us to conduct small mammal trapping and amphibian and reptile surveys within the state.

This project was supported by an agreement between the Bureau of Land Management and the Montana Natural Heritage Program, a cooperative program of the Montana State Library and the University of Montana (BLM L13AC00190)

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INTRODUCTION

Federal lands administered by the South Dakota Field Office of the Bureau of Land Management (BLM), have received limited attention for baseline inventories of birds, small terrestrial mammals, bats, amphibians, or aquatic reptiles. Current observation data in the Montana Natural Heritage Program (MNHP) database for these lands are limited to a few bird point counts, miscellaneous small mammal surveys and incidental observations. Thus, there is a need for structured surveys to provide baseline information on the distribution and status of these taxa, especially those with state or global conservation status ranks of S1-S3 or G1-G3 (Appendix A) and those listed as Sensitive by the BLM. This information is vital to broad-scale resource management plans and project-level decisions.

To address this need we conducted structured surveys to document these species within BLM administered lands in western South Dakota, using point count surveys for birds, trap arrays for small mammals, acoustic bat detectors for bat, night time calling surveys for amphibians, and visual encounter surveys of wetlands for amphibians and reptiles. In addition to increasing the data within the MNPH database, conducting surveys to document the distribution, habitat association, and relative status of species across state BLM lands will provide managers with valuable information that can be used to manage lands for the benefit of wildlife and the people that work and recreate on these lands. Documentation of species, particularly species that are listed as sensitive by the BLM can help guide land management planning and practices to facilitate conservation of these species.

STUDY AREA

Across western South Dakota, the BLM manages lands in dispersed blocks of varying size. These lands are characterized by a diversity of soil types, elevations, geographic features, and vegetation cover. Except in the Black Hills, soils throughout the study area are predominantly clays and sandy loams. In the Black Hills soils are primarily rocky and silty loams, transitioning to sandy and clay loams in the foothills (NRCS 2014). Elevations range from approximately 500 m near the Missouri river in the east, to approximately 1,750 m in the Black Hills to the west.

Lands in the north of the state are dominated primarily by mixedgrass prairie with sparse low shrub cover and occasional badlands. Lands in the Black Hills are dominated by conifer forests with occasional stands of aspen and open meadows surrounding woody riparian areas dominated by willows. At the southern end of the Black Hills the vegetation transitions to patchy ponderosa pine and juniper forests, interspersed with large areas of mixedgrass prairie. In the eastern foot hills of the Black Hills, conifer forests are interspersed with deciduous forests dominated by burr oak and there is a transition to mixedgrass prairie. In the central portion of western South Dakota the vegetation is primarily mixedgrass prairie in the uplands transitioning to juniper and ponderosa pine forests, and badlands in the river breaks, with deciduous forests dominated by cottonwoods in the river bottoms. In the east along the Missouri river, the uplands are primarily dominated by mixedgrass prairie and large areas have been converted to agriculture. The river breaks in this area are primarily

dominated by prairie, or badlands with sparse shrubland. Precipitation in all areas is greatest in the summer due to numerous thunderstorms. Within the study area, the Black Hills receive the most moisture, on average 76 – 89 cm per year. The remainder of the area receives 25-38 cm of annual precipitation (NOAA 2012).

Based on these differences in habitat and geography we selected representative sampling areas, to ensure adequate documentation of wildlife species across BLM managed lands as these features can influence species distribution (Heisler et al. 2013). We selected these primary sampling areas based on 2 criteria: first that there was a relatively large block or blocks of BLM managed land in the area (> 3 km²) with road access, and second that these lands were representative of the surrounding habitat and unique from the other primary areas. Based on these criteria we selected 8 areas within the state (Figure 1).

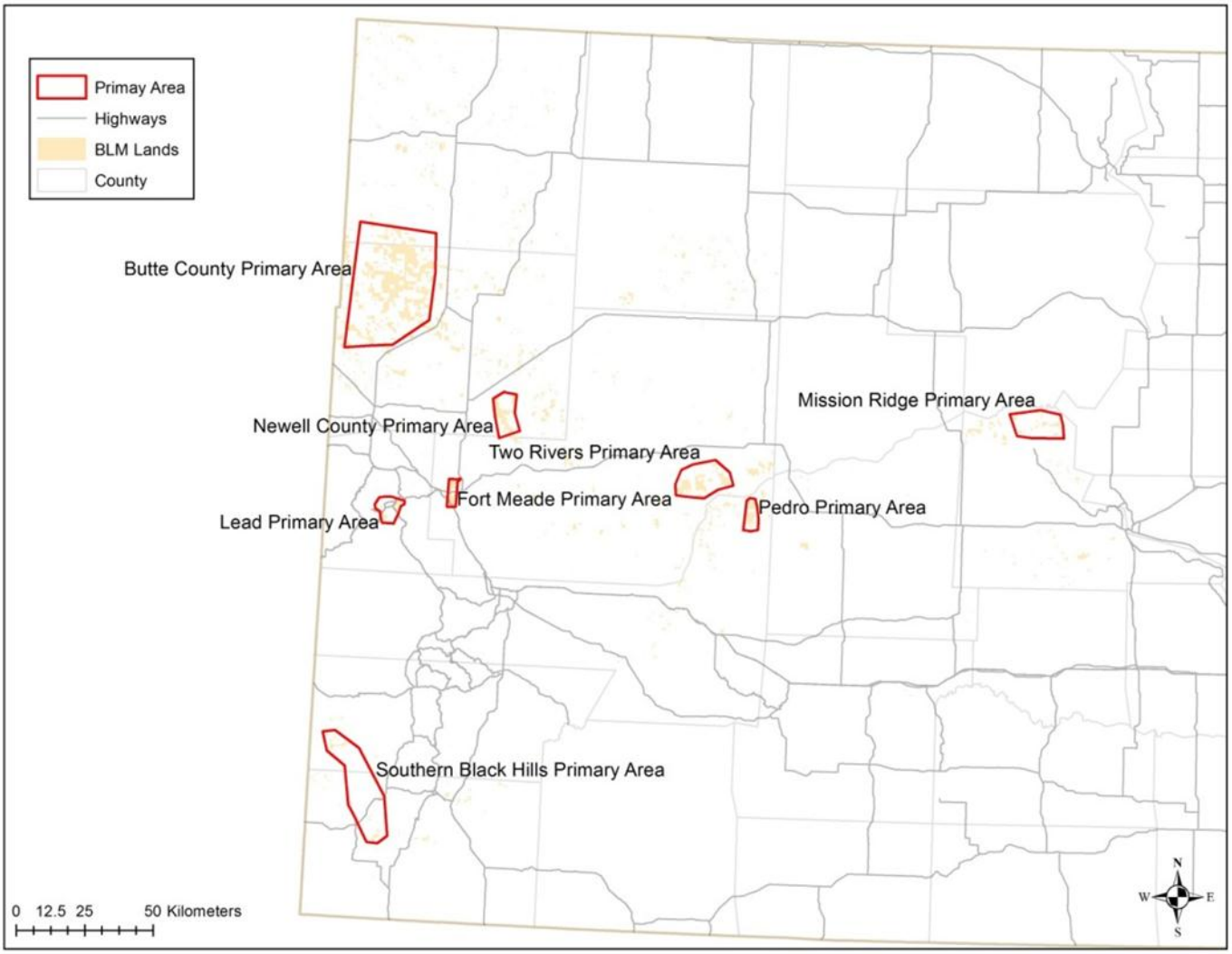

Figure 1. Primary survey areas in western South Dakota

Butte County Primary Survey Area

This area is in northwestern Butte County and the southern portion of Harding County (hereafter referred to as Butte County primary area) (Figure 2). It is approximately 1,230 km² in size and is characterized by rolling hills with ephemeral creeks and numerous stock reservoirs. The primary vegetation communities are mixedgrass prairie with sparse sagebrush steppe in the uplands and cotton wood and green ash stands along some riparian areas. The soils here are primarily clays.

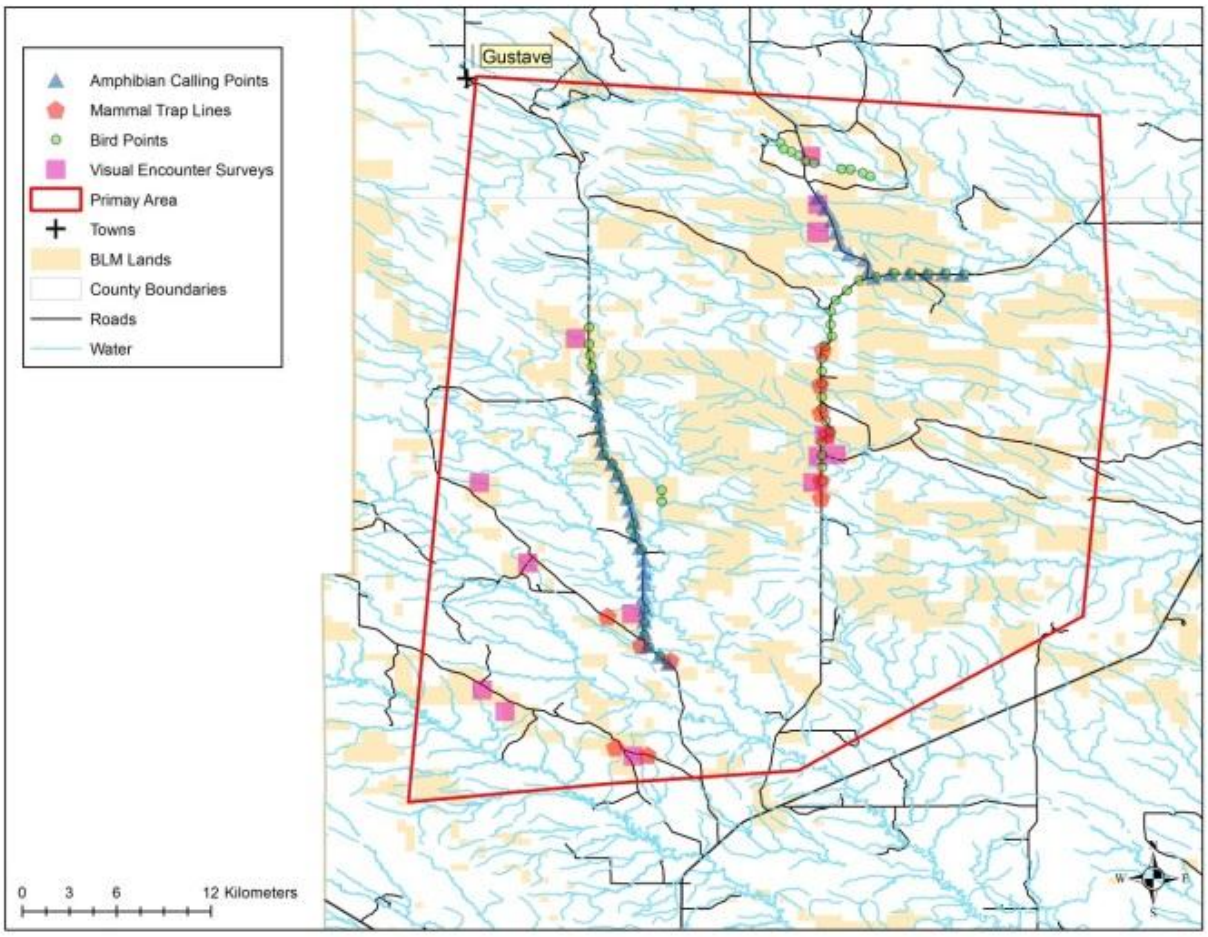

Figure 2.Butte County primary area survey locations

Newell Primary Survey Area

This area is east of Newell in southeastern Butte County (Figure 3). It is approximately 120 km² in size, and characterized by rolling hills, plains, and breaks dominated by mixed grass prairie, with occasional stock reservoirs. The soils here are primarily clays.

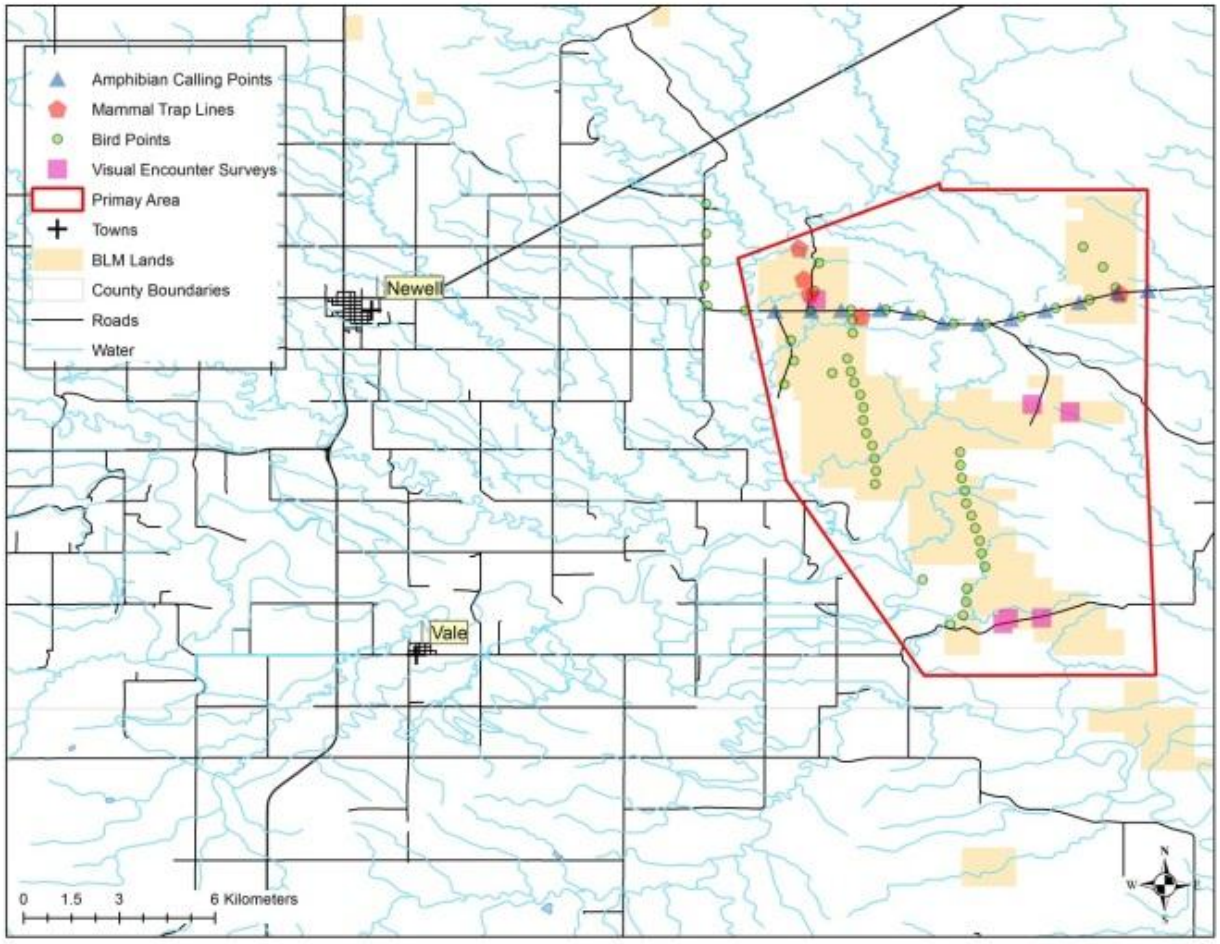

Figure 3.Newell primary area survey locations

Fort Meade Primary Survey Area

This area is outside of Sturgis in western Meade County (Figure 4). It is relatively small, approximately 30 km² in size, and is located at the transition of the Black Hills to the eastern prairie. The northern portion of this area is dominated by mixedgrass prairie, with occasional reservoirs and small streams, and bur oak stands. The central and southern portions of this area are rugged with numerous small mountains and sandstone breaks. There are occasional areas of mixedgrass prairie, but this portion of the area is dominated by ponderosa pine forests with burr oak and ash stands along small creeks and cotton wood forests along larger waterways. The soils here are primarily clay loams and sandy loams.

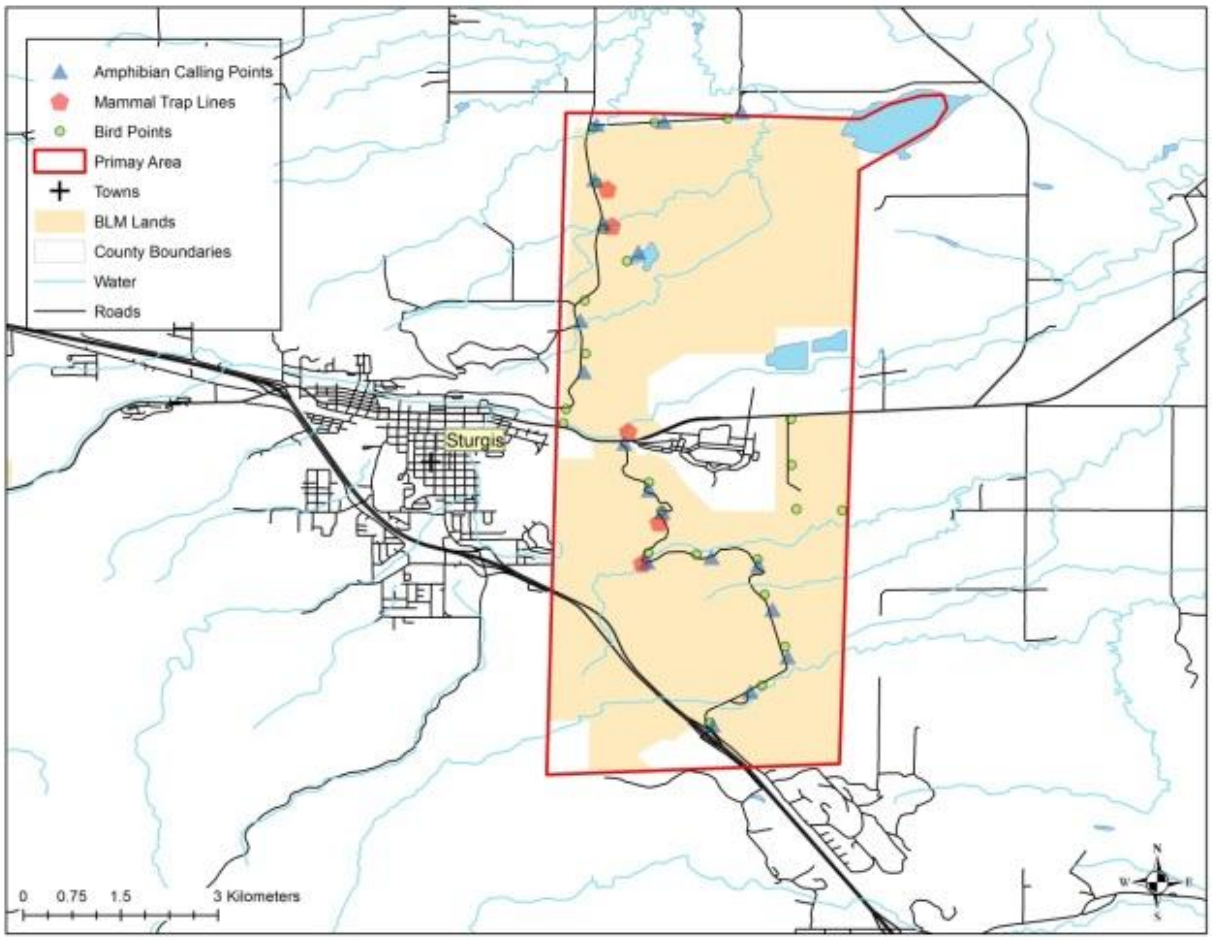

Figure 4. Fort Meade primary area survey locations

Lead Primary Survey Area

This area is in the north central Black Hills in central Lawrence County near the towns of Lead and Deadwood (Figure 5). It is approximately 70 km² in size and is rugged and dominated by conifer forest with occasional stands of aspen. Along waterways there are wet meadows dominated by brome grasses and willows. The soils of this area are primarily rocky and loamy.

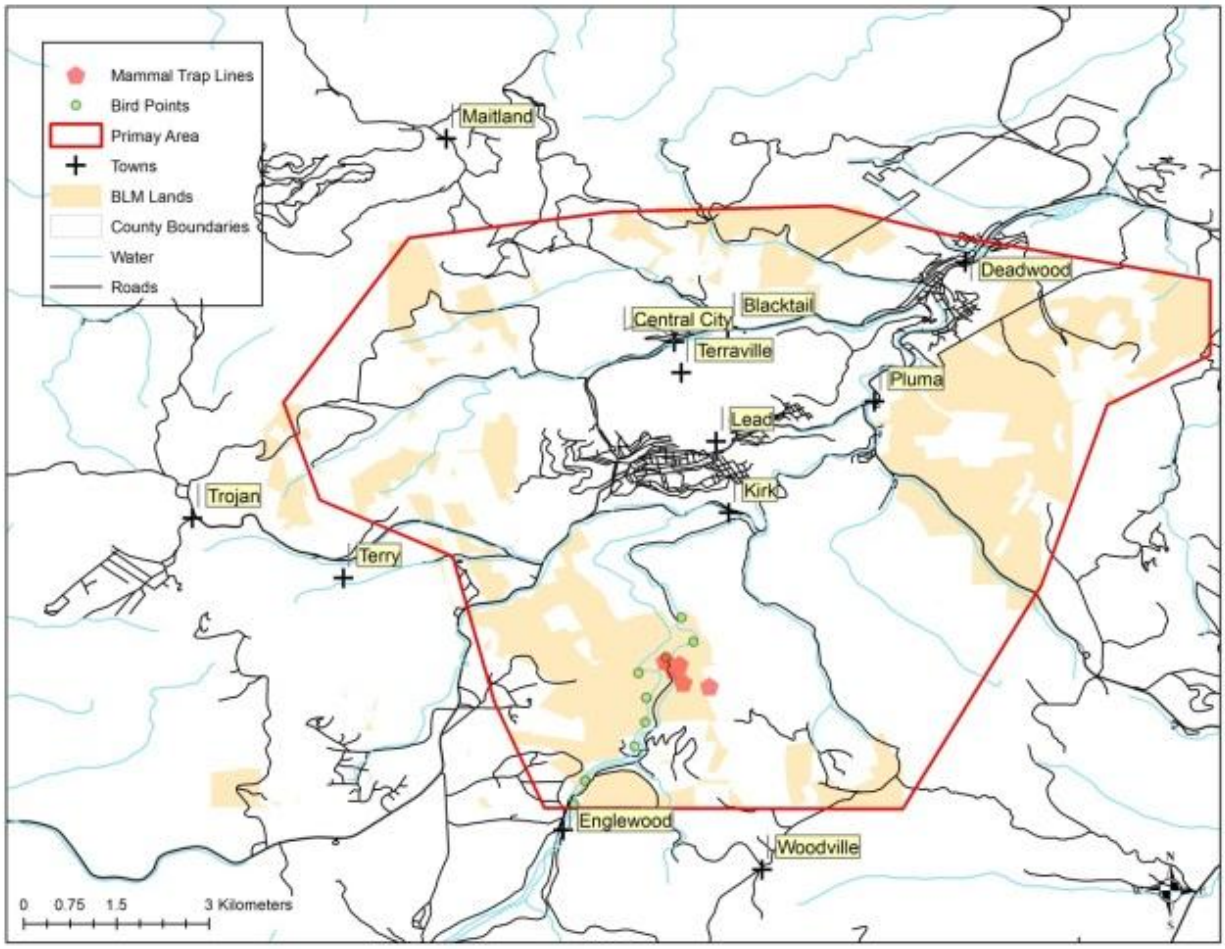

Figure 5. Lead primary area survey locations

Southern Black Hills Primary Survey Area

This area is located in the southern Black Hills west of Hot Springs in southern Custer and northern Fall River Counties (Figure 6). It had two areas of BLM managed lands: one 8 km² block located in southeastern Custer County; and the Fossil Cycad National Monument, is located off Highway 18 between Hot Springs and Edgemont in Northern Fall River County. This area has rolling hills with occasional deep ravines, dominated by either ponderosa pine forest or mixedgrass prairie. The soils of this area are rocky, with areas of silty and sandy loams and exposed sandstone bedrock.

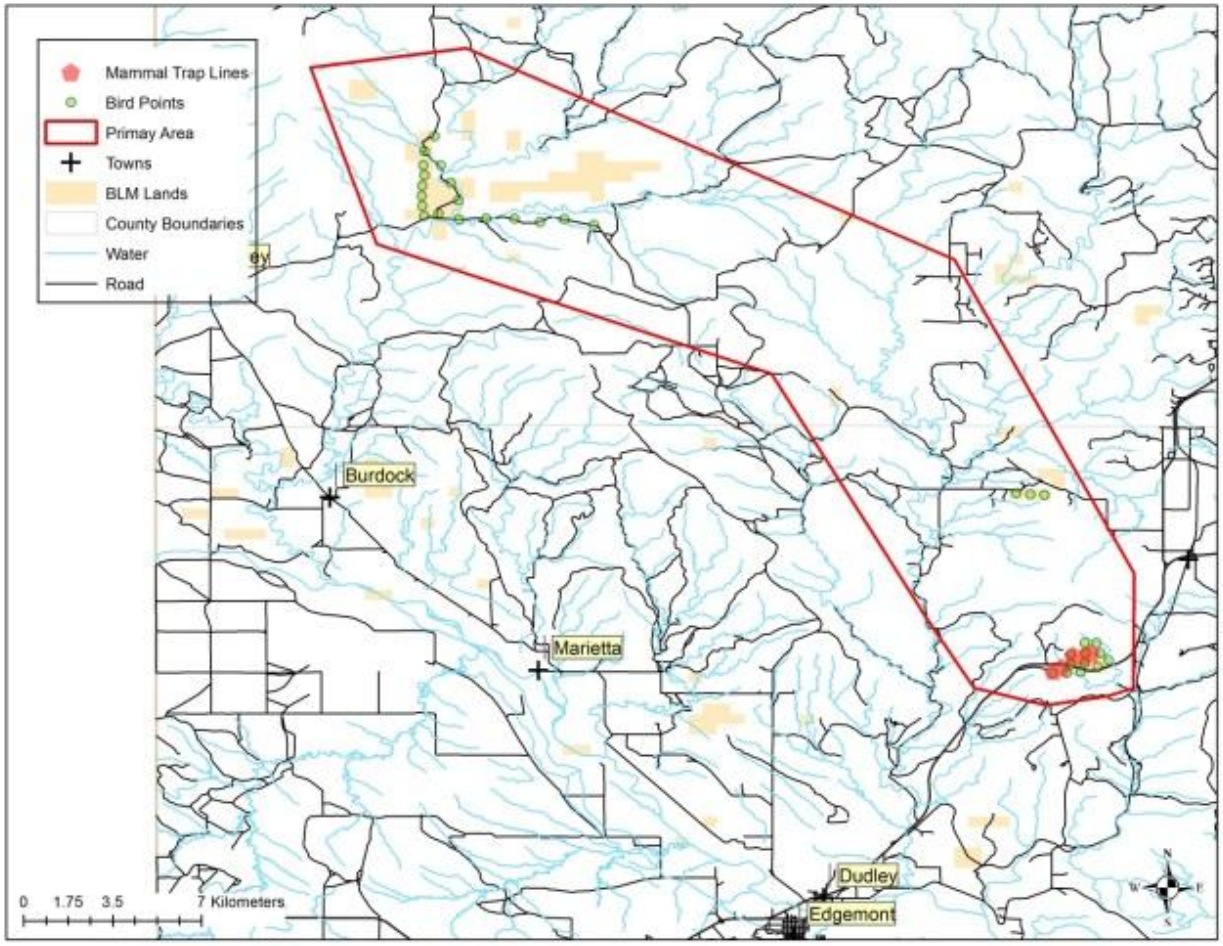

Figure 6. Southern Black Hills primary area survey locations

Pedro Primary Survey Area

This area is located in the northern Hakkon County in the vicinity of an abandoned town, Pedro (Figure 7). It is approximately 34 km² in size and is located in the breaks south of the Belle Fourche River. Vegetation is primarily juniper forests on east and north facing slopes, shrublands dominated by yucca and sumac and mixed grass prairie on the drier western facing slopes. The soils here are primarily clays.

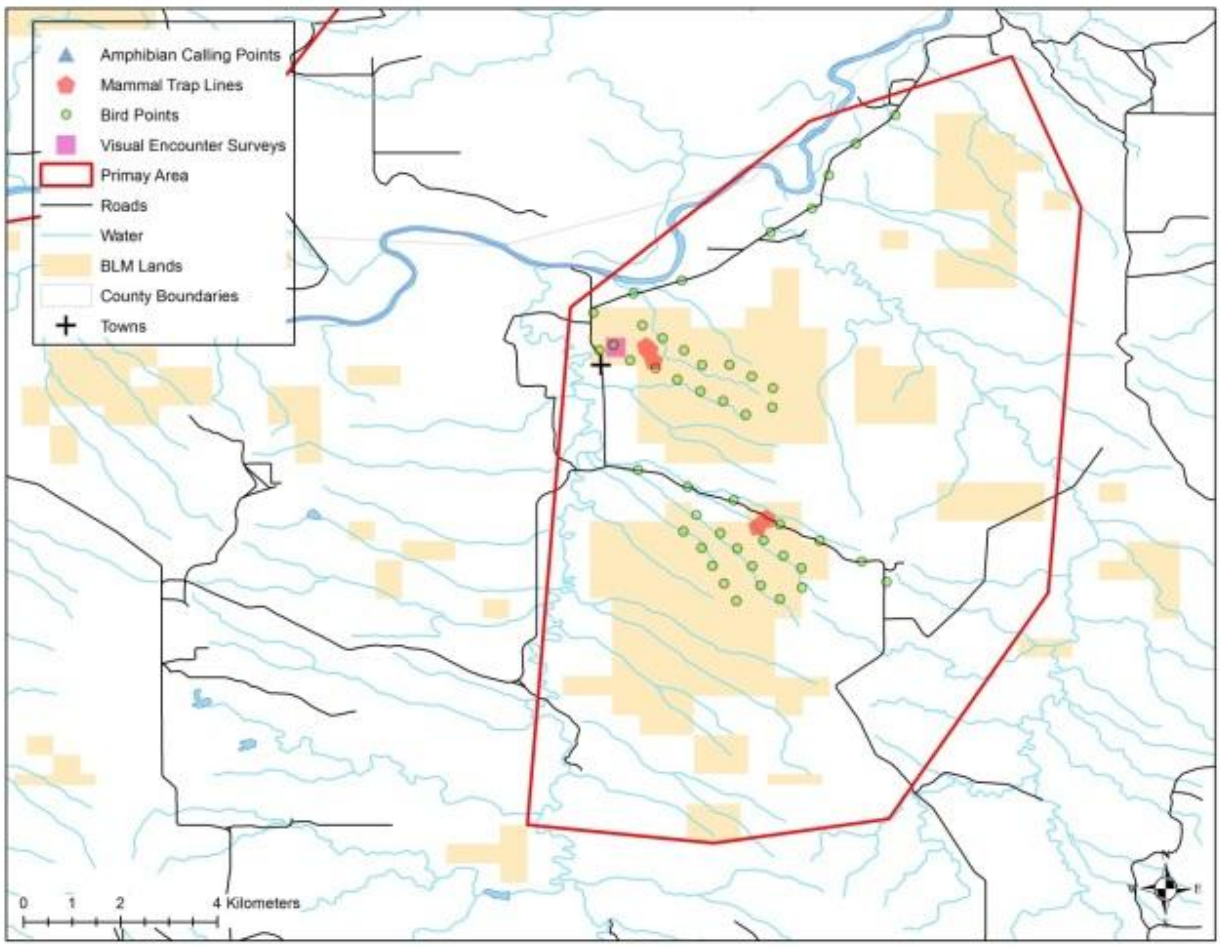

Figure 7. Pedro primary area survey locations

Mission Ridge Primary Survey Area

This area is located northwest of Pierre in the vicinity of the town of Mission Ridge south of Lake Oahe in northern Stanley County (Figure 8). Although this area was relatively large, approximately 190 km² in size, the BLM managed lands within it are dispersed small blocks. The area is characterized by rolling uplands covered by mixedgrass prairie with badland breaks along the edge of the reservoir. The soils here are primarily clays with areas of sandy loams.

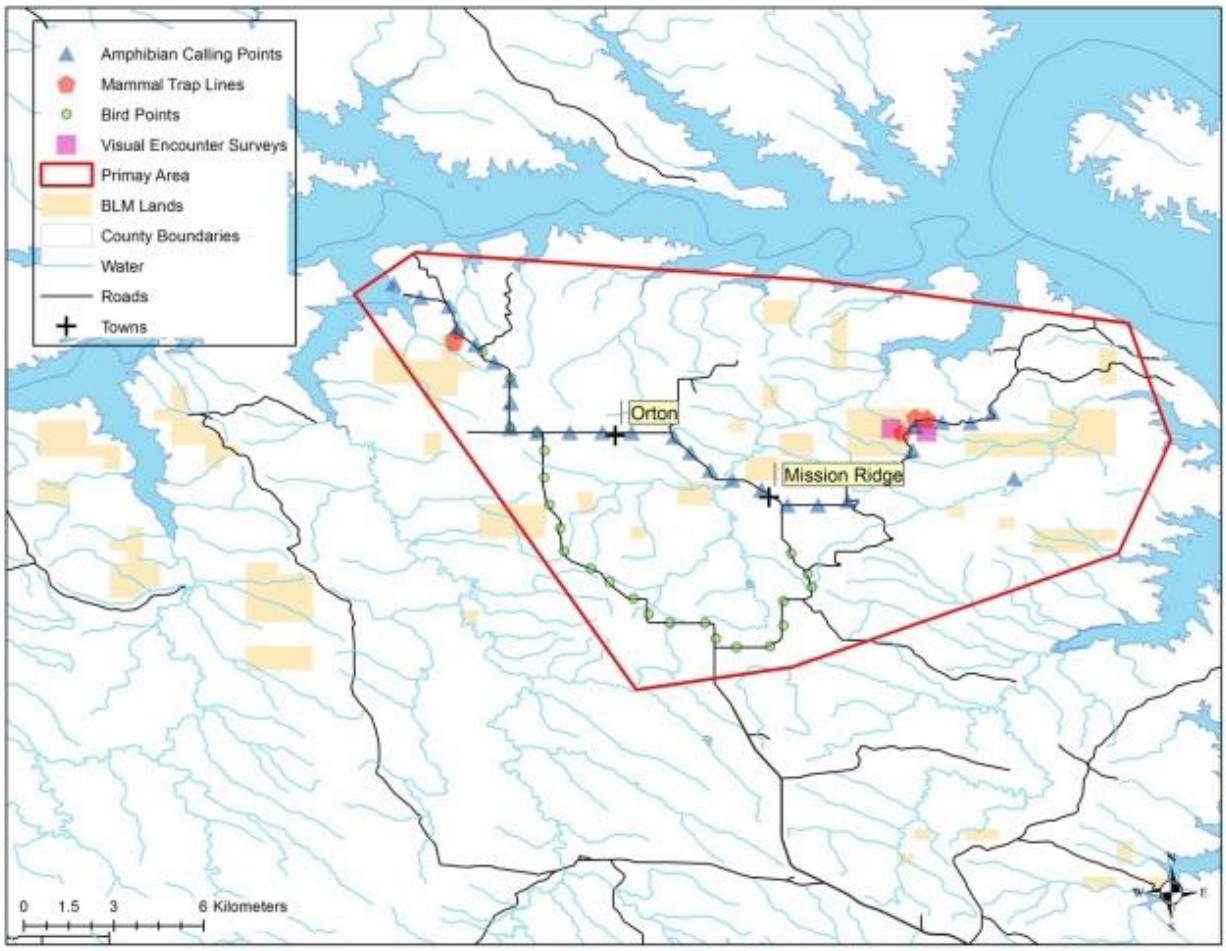

Figure 8. Mission Ridge primary area survey locations

Two Rivers Primary Survey Area

This area is located in the river breaks north of the confluence of the Belle Fourche and Cheyenne Rivers in southern Ziebach County (Figure 9). It is approximately 150 km² in size and consists of 3 blocks of BLM managed land. The uplands are dominated by mixedgrass prairie, while the breaks have sparse ponderosa pine forest, small outcrops of sandstone, badlands, and juniper forests in the draws. The soils are primarily clays with areas of loam.

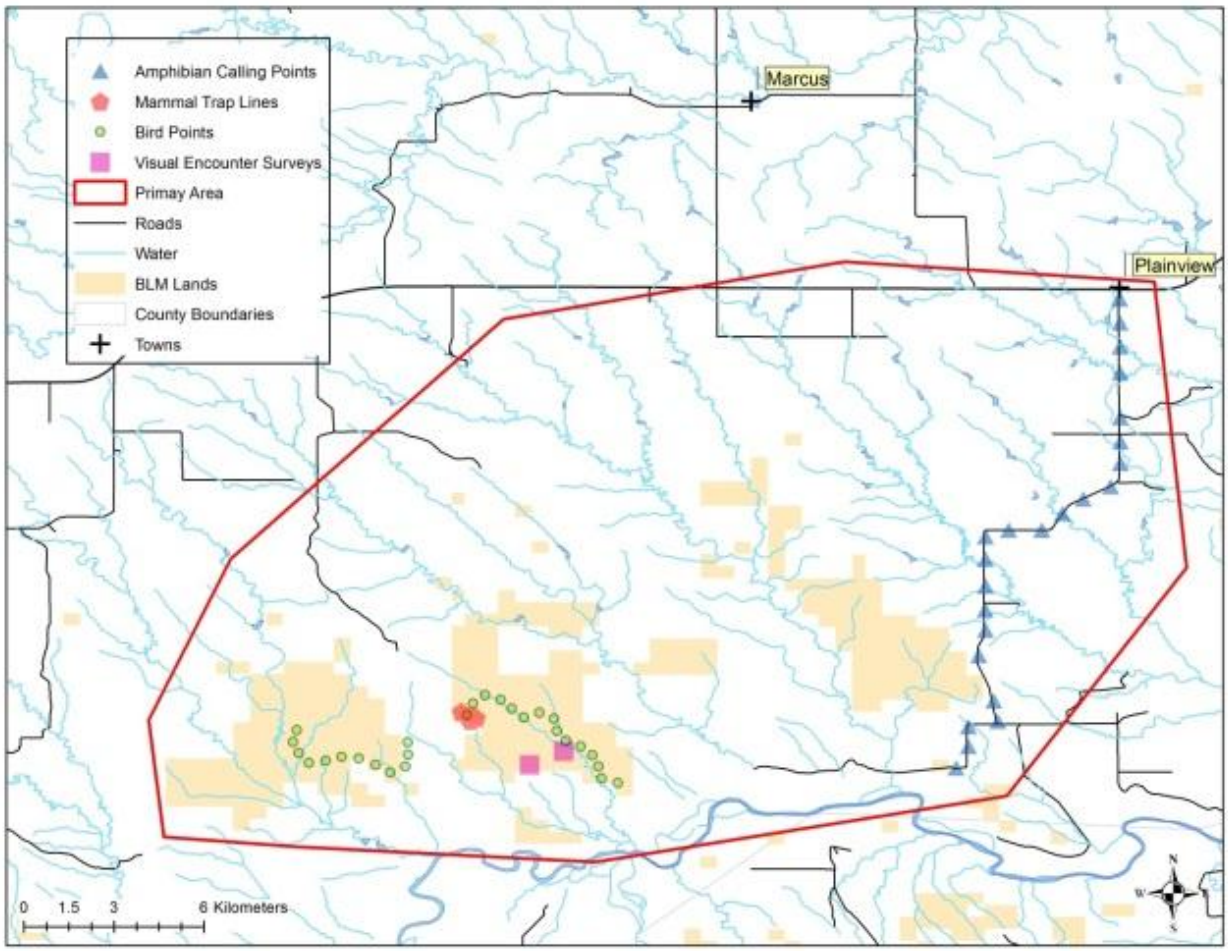

Figure 9. Two Rivers primary area survey locations

METHODS

Between May and September of 2014, we conducted surveys to document distribution, habitat associations, and status of bird, terrestrial small mammal, bat, amphibian, and reptile species across the eight primary survey areas. Within each primary area, we surveyed for bird species by conducting on- and off-road point count transects. We surveyed for terrestrial small mammals by setting trap lines using a variety of traps to maximize diversity of species detected. To document bat species, we placed long-term acoustic monitoring devices at 5 sentinel areas. We documented amphibian species at listening stations along road transects during early summer rain events and amphibians and aquatic reptiles with visual encounter surveys in wetlands. All species encountered incidentally during the course of this study were recorded to further increase distribution information for species not documented in structured surveys.

BIRD SURVEYS

To document the status and distribution of bird species within the study area, we conducted point counts using on- and off-road transects in May and June of 2014. For the road-based transects, we selected road routes that maximized the amount of BLM lands the road passed through and surveyed 24 points spaced 0.8 km apart over 18.4 km. In areas with little road access through BLM managed lands, we conducted off-road point counts by walking between points spaced 0.4 km apart with transects ranging from 3 to 16 points in length. At both on- and off-road transects, we surveyed from sunrise until we reached the desired number of points or until bird activity started to diminish around 10:00 a.m., whichever was occurred first. At each point, we surveyed for 10 minutes, recording the species and distance to each bird detected (*sensu* Hendricks et al. 2008). We also recorded nests or young detected as we moved between points.

SMALL MAMMAL SURVEYS

To document small mammal species present on BLM managed lands, we placed trap lines through a variety of habitats in each primary area (*sensu* Hendricks et al. 2007). Within each primary area we attempted to place trap lines in all distinct habitat types present. When the option to place multiple lines in one habitat type existed, we prioritized riparian areas and areas with tree or shrub cover since we expected these areas to support a higher diversity and abundance of small mammals. Along each trap line we designated 10 stations spaced 10 m apart, over 90 m. At each station we deployed an array of traps. We placed a cylindrical pit fall container (depth 20cm, diameter 15cm) at the center of the station and surrounded it at about 1 m distance in 3 cardinal directions with a Sherman trap (7.5 × 8.8 × 22.7-cm folding, H.B. Sherman Traps, Inc., Tallahassee, FL), a Museum Special snap trap (Forestry Suppliers, Jackson, MS), and a Victor snap trap (Woodstream Corporation, Lititz, PA). We baited Victor and Museum Special traps with peanut butter and the Sherman traps with commercial sweet feed. To ensure the welfare of animals captured in Sherman traps on cold nights, we also placed a small amount of synthetic quilt batting within each trap to allow animals to build nests if needed. If an animal was injured by the trap or during handling, we euthanized it using isoflurane (University of

Montana Institutional Animal Care and Use Committee protocol 025-13BMMNHP-050613).

Captured animals were identified in hand if possible based on morphological characteristics and pelage. If we were uncertain of the species of an individual specimen, we euthanized the individual and collected it as a voucher specimen for more detailed morphological analysis (Foresman 2012) at the Montana State University Zoological Museum in Bozeman, MT.

Bat Surveys

To document bat species present in the study area we placed SM2 BAT+ ultrasonic acoustic detectors (Wildlife Acoustics, Maynard, MA) near habitat features like reservoirs and rivers known to attract a diversity of bat species. Due to logistic constraints we only placed detectors in 3 of the 8 primary areas. SM2 BAT+ ultrasonic detectors can be left in the field over long periods of time on solar panels and deep cycle batteries so we deployed these detectors in late October of 2013 and plan to gather data through at least the fall of 2015; downloading data, checking system power, and ensuring that microphones are fully functional every two to four months. We used Sonobat (SonoBat Version 3.0 Montana, SonoBat, Arcata, CA) to identify acoustic recordings to species using Echolocation Call Characteristics of Montana Bats (Appendix B).

Amphibian and Reptile Surveys

We surveyed for amphibians using nighttime call station transects along roads after rains in the spring and early summer to detect breeding calls of adults (Heyer et al. 1994). We focused our call survey routes along roads that passed through and in close proximity to BLM lands, stopping to listen for calling amphibians at approximately 0.8 km intervals along each transect and recording the species detected, estimated number in each breeding chorus, and direction and distance to each breeding chorus.

We also conducted visual encounter surveys of wetlands on BLM managed lands using dipnets during the summer to detect adults and larvae (Heyer et al. 1994). These surveys supplemented the call surveys which may have missed Western Tiger Salamanders (*Ambystoma mavortium*) which do not vocalize and Northern Leopard Frogs (*Lithobates pipiens*) which breed in the early spring and may have been missed during our call survey efforts in some areas (Werner et al. 2004). To conduct these surveys, we walked the edge of the reservoir or wetland looking for amphibians and reptiles and used a dip net in shallow waters (< 0.5 m) to capture and identify amphibian larvae.

Incidental Observations

We recorded species incidentally encountered throughout our time in western South Dakota in order to document distribution information for species that were undetectable with the structured survey methodologies we employed (e.g. large mammals).

Analysis

For each primary survey area, we documented the species present, basic habitat associations, as well as baseline indices for relative spatial distribution and status. For birds, we tabulated the proportion of points we detected each species at within each of the major habitat types in each primary survey area as well as the average number of individuals detected at points the species was detected.

For small mammals, we tabulated the proportion of lines we detected each species at within each of the major habitat types in each

primary survey area as well as the catch per unit effort for each trap type (i.e. the number of individuals captured by a particular trap type divided by the number of available traps over all nights of trapping).

For bats, we tabulated monthly presence of individual species throughout the time ultrasonic detectors were deployed at each of the long-term monitoring sites as well as the overall amount of bat activity each month, the number of nights with bat activity, and the average, standard error, and range of the number of passes per night each month across all bat species.

For amphibian calling surveys, we tabulated the proportion of points a species was detected on, as well as the average estimated number of individuals calling at points where they were detected. Because we conducted visual encounter surveys at wetlands late in the summer after some amphibian species had metamorphosed and dispersed from breeding sites, we summarized that data with incidental observation data.

Availability of Data

All structured survey locations and locations of detections of animals during surveys or made incidentally is available online through the Montana Natural Heritage Program's MapViewer http://mtnhp.org/mapviewer/ so that is integrated with other survey and incidental observation data and more readily available for resource management plans and project-level planning.

RESULTS

BIRDS

Over all 8 primary areas we conducted 19 transect surveys, with 7 road transects and 12 walking transects (Table 1). In total we surveyed 278 points with 148 along road transects and 130 along walking transects. Road transects averaged 16 km in length, with 21 points. Walking transects averaged 4 km in length, with 11 points.

Table 1. Number of bird transects and points surveyed in each primary area on driving and walking transects.

Primary Area	No. Driving Transects (Points)	No. Walking Transects (Points)	Total No. Transects (Points)
Butte County	2 (48)	2 (13)	4 (61)
Newell	1 (24)	2 (29)	3 (53)
Fort Meade	1 (24)	0	1 (24)
Lead	0	1 (10)	1 (10)
S. Black Hills	1 (12)	3 (21)	4 (33)
Pedro	1 (16)	2 (30)	3 (46)
Mission Ridge	1 (24)	0	1 (24)
Two Rivers	0	2 (27)	2 (27)
Totals	**7 (148)**	**12 (130)**	**19 (278)**

During Point count surveys we detected 100 species of birds, 11 of which are listed as Sensitive by the BLM (Table 2) and 1 of which is on South Dakota's Rare, Threatened or Endangered Animals list (SDNHP 2014). We detected the highest diversity of bird species in Central South Dakota, where the prairie transitions to conifer forests, and the lowest diversity within the conifer forests of the Black Hills.

In the Butte County primary area, we conducted point counts in mixedgrass prairie with occasional sparse sagebrush cover and stock reservoirs, and within riparian woodlands along ephemeral creeks. During the road transect surveys we detected 30 species, 2 of which are BLM Sensitive (Table C-1). While conducting walking transect surveys, we detected 30 species, 2 of which are BLM Sensitive (Table C-2).

In the Newell Primary area, we conducted point counts in mixedgrass prairie. During road transect surveys we detected 28 species, 4 of which are BLM Sensitive (Table C-3). During the walking transect surveys we detected 25 species, 2 of which are BLM Sensitive (Table C-4).

In the Fort Meade primary area, we conducted point counts in mixedgrass prairie, coniferous forest, and deciduous woodland. We detected 47 species, 1 of which are BLM Sensitive (Table C-5).

In the Lead primary area, we conducted point counts in coniferous forest, detecting 16 species (Table C-6). This species count is likely low as there was occasional heavy rain over the duration of the survey, and we concluded the survey early due to decreased bird activity.

In the Southern Black Hills primary area, we conducted surveys in mixedgrass prairie, sparse coniferous woodland dominated by ponderosa pine and juniper, and deciduous riparian woodland. We detected 25 species during the road survey (Table C-7). During the walking transect surveys we detected 32 species (Table C-8).

In the Pedro primary area, we surveyed points in mixedgrass prairie and prairie areas adjacent to deciduous woodlands, and juniper woodlands. While conducting the road based

survey, we detected 36 species, 3 of which are BLM Sensitive with one also listed as a South Dakota Rare, Threatened, or Endangered Animal (Table C-9, SDNHP 2014). During the walking surveys we detected 37 species, including 2 that are BLM Sensitive (Table C-10).

In the Mission Ridge primary area we surveyed points in mixedgrass prairie, detecting 28 species, 2 of which are listed as BLM Sensitive (Table C-11).

In the Two Rivers primary area we surveyed points in juniper woodlands and grasslands within badlands. During these surveys we detected 31 species, 1 of which is BLM Sensitive (Table C-12).

Throughout the field season we recorded 1,015 incidental observations of 111 unique bird species, including 25 not detected during point counts; 5 of which are BLM Sensitive (Table 2).

Table 2. Bird species detected during structured surveys and incidentally. Numbers represent the number of individuals detected. Global ranks are listed, along with the state ranks of rare, threatened, and endangered species. Species denoted with an * are BLM Sensitive species.

Bird Species	Survey Detections	Incidental Detections	Proportion Primary Areas Detected (n=8)	Global (G) & some State (S) Ranks
Cormorants				
Double-crested Cormorant	0	1	0.12	G5
Waterfowl				
American Wigeon	2	11	0.25	G5
Blue-winged Teal	3	27	0.62	G5
Canvasback	0	2	0.12	G5
Gadwall	1	9	0.5	G5
Green-winged Teal	0	4	0.25	G5
Mallard	18	31	0.62	G5
Northern Pintail	1	5	0.38	G5
Northern Shoveler	0	12	0.25	G5
Ruddy Duck	0	1	0.12	G5
Wood Duck	0	1	0.12	G5
Canada Goose	16	6	0.5	G5
Falcons				
American Kestrel	7	14	0.75	G5
Prairie Falcon	0	4	0.38	G5
Merlin	2	2	0.38	G5
Raptors				
Red-tailed Hawk	3	6	0.75	G5
Golden Eagle *	6	8	0.5	S3S4B,S3N /G5
Northern Harrier	2	2	0.38	G5
Ferruginous Hawk *	1	4	0.25	S4B,SZN /G4
Swainson's Hawk	2	0	0.12	S4B,SZN /G5
Bald Eagle *	1	5	0.25	S1B,S2N /G5
Nighthawks				
Common Nighthawk	11	20	0.88	G5
Owls				
Burrowing Owl*	2	2	0.38	S3S4B,SZN /G4
Short-eared Owl	1	0	0.12	G5
Great Horned Owl	0	7	0.25	G5
Pelicans				
American White Pelican	3	1	0.38	S3B,SZN /G4
Herons				
Great Blue Heron	3	6	0.62	S4B,SZN /G5
Pigeons/Doves				
Rock Pigeon	1	0	0.12	G5
Mourning Dove	156	42	0.88	G5
Rails				
American Coot	1	8	0.38	G5
Shorebirds				

Killdeer	33	40	0.75	G5
Upland Sandpiper	80	43	0.88	G5
Long-billed Curlew *	4	4	0.38	S3B,SZN /G5
Marbled Godwit	0	2	0.25	G5
Spotted Sandpiper	1	6	0.38	G5
Wilson's Phalarope	8	16	0.38	G5
Wilson's Snipe	2	0	0.12	G5
American Avocet	0	2	0.25	G5
Gulls				
Ring-billed Gull	5	2	0.38	G5
Blackbirds				
Bobolink	17	4	0.75	G5
Brown-headed Cowbird	168	25	0.88	G5
Brewer's Blackbird	9	5	0.25	G5
Eastern Meadowlark	0	1	0.12	S2B,SZN /G5
Western Meadowlark	231	80	0.88	G5
Common Grackle	19	10	0.62	G5
Orchard Oriole	4	10	0.5	G5
Red-winged Blackbird	91	40	1	G5
Yellow-headed Blackbird	4	3	0.38	G5
Chicadees				
Black-capped Chickadee	27	10	0.62	G5
Finches				
Pine Siskin	0	4	0.25	G5
American Goldfinch	11	10	0.62	G5
Red Crossbill	0	1	0.12	G5
Flycatchers				
Eastern Kingbird	26	26	0.88	G5
Scissor-tailed Flycatcher	0	1	0.12	G5
Western Kingbird	16	11	0.62	G5
Dusky Flycatcher	1	0	0.12	G5
Great Crested Flycatcher	0	1	0.12	G5
Western Wood-Pewee	1	5	0.38	G5
Cordilleran Flycatcher	0	1	0.12	G5
Alder Flycatcher	0	1	0.12	G5
Willow Flycatcher	2	2	0.25	G5
Gnatcatchers				
Blue-gray Gnatcatcher *	1	0	0.12	S1B,SZN /G5
Jays/Crows/ Magpies				
American Crow	43	8	0.62	G5
Blue Jay	6	8	0.5	G5
Black-billed Magpie	23	6	0.38	G5
Kinglets				
Golden-crowned Kinglet	0	1	0.12	G5
Ruby-crowned Kinglet	9	1	0.12	G5
Larks				
Horned Lark	69	35	0.88	G5
Longspurs				
Chestnut-collared Longspur*	21	12	0.25	G5
Nuthatches				
White-breasted Nuthatch	1	2	0.12	G5
Red-breasted Nuthatch	12	13	0.5	G5
Pipits				
Sprague's Pipit*	1	1	0.12	S2B,SZN /G4
Shrikes				
Loggerhead Shrike*	5	9	0.38	G4
Sparrows/ Buntings				
Baird's Sparrow*	0	1	0.12	S2B,SZN /G4
Lark Sparrow	80	21	0.88	G5
Grasshopper Sparrow	91	27	0.88	G5
Vesper Sparrow	0	16	0.5	G5
Brewer's Sparrow *	0	1	0.12	G5

Lark Bunting	124	54	0.75	G5
Field Sparrow	54	12	0.62	G5
Chipping Sparrow	25	11	0.62	G5
Dark-eyed Junco	3	2	0.25	G5
Spotted Towhee	63	10	0.75	G5
Song Sparrow	7	2	0.25	G5
Starlings				
European Starling	21	3	0.62	G5
Swallows				
Tree Swallow	11	3	0.62	G5
Cliff Swallow	5	0	0.12	G5
Northern Rough-winged Swallow	21	7	0.62	G5
Barn Swallow	32	15	0.62	G5
Tanagers/ Cardinals/ Buntings				
Black-headed Grosbeak	5	0	0.25	G5
Blue Grosbeak	13	11	0.38	G5
Western Tanager	4	2	0.38	G5
Lazuli Bunting	2	0	0.12	G5
Dickcissel	20	6	0.38	G5
Thrashers Mockingbirds / Catbirds				
Gray Catbird	1	0	0.12	G5
Sage Thrasher *	0	1	0.12	S2B,SZN /G5
Brown Thrasher	6	16	0.75	G5
Thrushes				
Mountain Bluebird	5	3	0.25	G5
Eastern Bluebird	1	1	0.12	G5
Swainson's Thrush	2	1	0.25	G5
Townsend's Solitaire	0	1	0.12	G5
American Robin	31	12	0.62	G5
Vireos				
Bell's Vireo	2	2	0.38	G5
Red-eyed Vireo	2	1	0.25	G5
Plumbeous Vireo	1	0	0.12	G5
Warblers				
Yellow Warbler	18	9	0.88	G5
Yellow-breasted Chat	4	1	0.38	G5
Common Yellowthroat	4	2	0.38	G5
Yellow-rumped Warbler	5	3	0.12	G5
Ovenbird	4	0	0.25	G5
Waxwings				
Cedar Waxwing	8	5	0.62	G5
Wrens				
House Wren	14	2	0.38	G5
Canyon Wren	1	1	0.12	G5
Rock Wren	12	5	0.5	G5
Upland Game Birds				
Ring-necked Pheasant	23	0	0.38	G5
Greater Sage-Grouse*	0	1	0.12	G3G4
Sharp-tailed Grouse	0	3	0.25	G5
Wild Turkey	8	3	0.38	G5
Woodpeckers				
Red-headed Woodpecker*	1	3	0.38	G5
Northern Flicker	19	15	0.88	G5
Hairy Woodpecker	1	2	0.25	G5
Red-naped Sapsucker	2	2	0.12	G5
Vultures				
Turkey Vulture	5	12	0.62	G5

MAMMALS

Across the survey area, we placed 47 trap-lines (Table 3). We trapped most lines for three nights; one line in the Newell primary area had to be removed after one night due to cattle damage.

Table 3. Number of small mammal traplines and bat acoustic detectors deployed over all primary areas.

Primary Area	Number of Traplines	Number of Bat Detectors
Butte County	11	2
Newell	6	2
Fort Meade	5	1
Lead	5	0
S. Black Hills	5	0
Pedro	5	0
Mission Ridge	5	0
Two Rivers	5	0
Totals	**47**	**5**

We deployed small mammal traplines between mid-August and mid- September 2014. Across all primary areas we captured 15 species of small mammals, none of which are listed as sensitive by the BLM, or as a rare, threatened, or endangered animal (Table 4, SDNHP 2014). We were able to identify all species in hand except for one shrew (*Sorex* spp.) caught in a sagebrush shrubland. After examination of cranial morphology in a zoological museum we feel reasonably confident that this is a Montane Shrew (*S. monticolus*) or Dwarf Shrew (*S. nanus*), but are awaiting the results of a detailed examination of its guard hairs (*sensu* Pocock and Jennings 2006) before making a final decision on the species identification.

We detected the greatest diversity of small mammal species in the conifer forests of the Black Hills, while mammal communities were the least diverse in the mixedgrass prairies of west central South Dakota.

In the Butte County primary area, we placed traplines in mixedgrass prairie, barren habitat, shrublands, and along an ephemeral creek, detecting 6 species (Tables D-1, D-2).

In the Newell primary area, we set traplines in mixedgrass prairie detecting 3 species (Tables D-3, D-4).

In the Fort Meade primary area, we placed traplines in mixedgrass prairie, herbaceous wetland, deciduous woodland dominated by cottonwood, green ash and bur oak, and ponderosa pine woodland, detecting 4 species (Tables D-5, D-6).

In the Lead primary area, we placed traplines in coniferous woodland, a wet meadow, and a woody riparian area adjacent to a creek, detecting 7 species (Tables D-7, D-8).

In the southern Black Hills primary area at the Fossil Cycad National Monument, we placed traplines in mixed grass prairie and ponderosa pine forest, detecting 4 species (Tables D-9, D-10).

In the Pedro primary area, we placed traplines in shrublands dominated by silver sagebrush and yucca, coniferous woodland dominated by rocky mountain juniper, and a coulee bottom dominated by mixed grass prairie, detecting 5 species (Tables D-11, D-12).

In the Mission Ridge primary area, we placed traplines in mixedgrass prairie, barren badlands, and a shrubland, detecting 3 species (Tables D-13, D-14).

In the Two Rivers primary area, we placed traplines in barren badlands, coniferous

woodland dominated by ponderosa pine, and mixedgrass prairie capturing 5 species (Tables D-15, D-16).

We deployed 5 SM2 acoustic bat detectors in 3 primary areas in October 2013 and intend to have them deployed through the fall of 2015. We analyzed and summarized echolocation call information through August 2014 for this report. In the Butte County primary area, we placed one detector next to a stock reservoir next to Old Highway 85 near Battle Creek and placed the other on a bench next to the South Fork of the Moreau River near the Harding Road. In the Newell primary area, we placed one detector on a small ridge overlooking Jug Creek and the other detector next to the Belle Fourche River by the Bismarck Bridge. In the Fort Meade primary area we placed a detector next to Fort Meade Reservoir.

Across all primary survey areas, we definitively identified echolocation calls of 6 species with bat activity in October and November 2013 and between April and August 2014; no bat activity was detected in December of 2013 or January, February, or March of 2014 (Tables E-1, E-2).

In the Butte County primary area, we detected 5 bat species, 4 at the Battle Creek detector and 3 at the South Fork of the Moreau River detector (Table E-1). At Battle Creek, we detected bat activity between May and August 2014 with the greatest amount of activity recorded in May and then decreasing through August (Table E-2). At the South Fork of the Moreau River, we detected bats between April and August 2014 with the greatest amount of activity in August (Table E-2).

In the Newell primary area, we detected a total of 6 bat species, 5 at the Jug Creek detector and 6 at the Bismarck Bridge detector (Table E-1). At Jug Creek, we detected bats between May and August 2014 (Table E-2). At Bismarck Bridge, we detected bats between April and August 2014 (Table E-2). At both stations bat activity was greatest in July 2014 (Table E-2).

In the Fort Meade primary area, we detected 5 bat species at the Fort Meade Reservoir with bat activity in October and November 2013 and between April and August 2014 (Tables E-1, E-2). Bat activity was greatest and relatively constant in May, June, and July of 2014 (Table E-2).

Throughout the field season we recorded 120 incidental observations of 20 unique mammal species, including 17 not detected at traplines or bat acoustic detectors; one of these is BLM Sensitive (Table 4).

Table 4. Mammal species detected within the survey area during structured surveys and incidentally. Columns display the number of traplines where each species was detected, the number of point observations of each species, and the proportion of primary areas within which each species was detected. Bat species that could be definitively identified by echolocation calls are denoted with a "D". Global ranks are listed, along with the state ranks of rare, threatened and endangered species. Species denoted with a * are BLM Sensitive species.

Mammal Species	Survey Detections	Incidental Detections	Proportion of Primary Areas Detected (n = 8)	Global (G) & some State (S) Ranks
Bats				
Big Brown Bat	D	0	0.66 (n=3)	G5
Silver-haired Bat	D	0	1 (n=3)	S4/G 5
Eastern Red Bat	D	0	1 (n=3)	G5
Hoary Bat	D	0	0.66 (n=3)	G5

Western Small-footed Myotis	D	0	1 (n=3)	G5
Little Brown Myotis	D	0	1 (n=3)	G3
Shrews				
Least Shrew	1	0	0.12	S3 /G5
Masked Shrew	3	0	0.12	G5
Sorex Spp.	1	0	0.12	
Pocket Mice				
Hispid Pocket Mouse	5	0	0.25	G5
Pocket Gophers				
Northern Pocket Gopher	0	18	0.75	G5
Beavers				
Beaver	0	1	0.12	G5
Porcupines				
Porcupine	0	1	0.12	G5
Squirrels				
Black-tailed Prairie Dog *	0	25	0.62	G4
Thirteen-lined Ground Squirrel	2	1	0.12	G5
Eastern Fox Squirrel	0	2	0.12	G5
Least Chipmunk	1	5	0.25	G5
Red Squirrel	0	11	0.38	G5
Mice/ Voles				
Long-tailed Vole	3	0	0.12	G5
Prairie Vole	8	0	0.5	G5
Meadow Vole	7	1	0.38	G5
Southern Red-backed Vole	3	0	0.12	G5
Northern Grasshopper Mouse	3	0	0.12	G5
White-footed Mouse	13	0	0.62	G5
Deer Mouse	35	0	1	G5
Western Harvest Mouse	2	0	0.25	G5
Plains Harvest Mouse	4	0	0.5	G5
Rabbits				
White-tailed Jack Rabbit	0	6	0.38	G5
Desert Cottontail	0	2	0.25	G5
Skunks				
Striped Skunk	0	1	0.12	G5
Weasels				
Badger	0	4	0.38	G5
Raccoons				
Raccoon	0	6	0.12	G5
Wolves/ Coyotes/ Foxes				
Coyote	0	1	0.12	G5
Red Fox	0	1	0.12	G5
Pronghorn				
Pronghorn	0	22	0.5	G5
Deer/ Moose/ Elk				
Elk	0	1	0.12	G5
Mule Deer	0	1	0.12	G5
White-tailed Deer	0	10	0.62	G5

AMPHIBIANS AND REPTILES

We surveyed 123 nighttime amphibian call survey stations on 6 call survey routes in 4 primary areas on rainy nights in late-May through mid-June 2014 (Table 5). Not all primary areas were surveyed due to a lack of wetlands in proximity to roads and unfavorably dry conditions.

Table 5. Number of nighttime amphibian call surveys performed in each primary area.

Primary Area	Number of Call Survey Routes (Points Surveyed)
Butte County	2 (39)
Newell	1 (12)
Fort Meade	1 (18)
Lead	0
S. Black Hills	0
Pedro	0
Mission Ridge	1 (29)
Two Rivers	1 (25)
Totals	**6 (123)**

Across all primary areas we detected 5 amphibian species, including 2 that are BLM Sensitive (Table 6). We detected the highest diversity of amphibians in the mixedgrass prairies of central South Dakota in close proximity to the Belle Fourche River. The least diverse area was in mixedgrass prairie in west central South Dakota (Appendix F). In the Butte County primary area we detected 3 species calling (Table F-1). In the Newell primary area we detected 1 species (Table F-2). In the Fort Meade primary area we detected 2 species (Table F-3). In the Mission Ridge primary area we detected 2 species calling (Table F-4). In the Two Rivers primary area we detected 4 species (Table F-5).

Across the study area we had 1,341 point observations of 6 amphibian species. We did not observe any amphibian species incidentally that were not detected during surveys. We had 62 incidental point observations of 8 reptile species (Table 6).

Table 6. Amphibian and reptile species detected within the survey area during structured surveys and incidentally. Columns display the number of calling survey points where each species was detected, the number of point observations of each species, and the proportion of primary areas within which each species was detected. Global ranks are listed, along with the state ranks of rare, threatened and endangered species. Species denoted with a * are BLM Sensitive species.

Amphibian and Reptile Species	Survey Detections	Incidental Detections	Proportion of Primary Areas Detected (n = 5)	Global (G) & some State (S) Ranks
Amphibians				
Mole Salamanders				
Western Tiger Salamander	0	9	0.5	G5
True Toads				
Great Plains Toad*	19	3	0.25	G5
Woodhouse's Toad	13	9	0.25	G5
True Frogs				
Northern Leopard Frog	10	31	0.75	G5
Boreal Chorus Frog	96	82	0.88	G5
Spadefoot Toads				
Plains Spadefoot*	18	1	0.38	G5
Reptiles				
Pond Turtles				
Painted Turtle	0	12	0.63	G5
Vipers				
Prairie Rattlesnake	0	2	0.13	G5
Colubrid Snakes				
Smooth Greensnake	0	1	0.13	S4 /G5
Gophersnake	0	3	0.38	G5
Terrestrial Gartersnake	0	7	0.5	G5
Plains Gartersnake	0	11	0.38	G5
Sagebrush/ Spiny Lizards				
Greater Short-horned Lizard*	0	1	0.13	S2 /G5

DISCUSSION/ RECOMMENDATIONS

Over western South Dakota, riparian habitats within mixedgrass prairie on public lands generally lack shrub or tree cover (D. Bachen, personal observation). Both riparian and upland sites with adequate tree and shrub cover have been previously documented to support a diverse community of birds, bats, and terrestrial small mammals not typically found in associated prairie habitats (Bjugstad and Girard 1984, Finch and Ruggiero 1993). We similarly found that communities of bird and bat species differ between these habitat types (Tables C-1, C-2, and E-2). However, our ability to conduct surveys to further explore these community differences and document species occurring in riparian woodlands was hampered by a lack of riparian woodlands on public lands. We recommend future efforts focus on gaining access to existing riparian woodlands located on private property in order to conduct surveys in these habitats. We also recommend efforts to conserve existing riparian woodlands and restore riparian woodland areas that are becoming deforested by mimicking the natural frequency and intensity of disturbances resulting from historical grazing, fire, and flood regimes (Bjugstad and Girard 1984, Sieg 1995).

Naturally occurring and manmade lentic wetlands are biodiversity hotspots on the prairie landscape that are essential for some groups like waterbirds, amphibians, and aquatic reptiles. Use of wetlands by livestock has been shown to affect some species of wildlife through degradation of water quality and reduction of associated aquatic and terrestrial vegetation (Knutson et al. 2004, Schmutzer et al. 2008). We didn't see major impacts to wetland habitats during the course of our study in western South Dakota, but encourage managers to work toward maintaining wetlands in their present state by mimicking frequencies and intensities of disturbance associated with historical grazing regimes of native ungulates.

Terrestrial small mammals play an important role in many of the ecosystems within the study area. Small mammals are prey for a diversity of species including raptors and shrikes and their burrows also provide shelter for species like Burrowing Owls (*Athene cunicularia*) and Great Plains Toads (*Anaxyrus cognatus*). Both vegetation and soil type are important components of habitat for small mammals, and efforts to conserve these species should focus on these habitat attributes. One of the primary threats to small mammal populations is alteration of native habitat through the invasion of nonnative plant species which have the potential to alter the physical structure of vegetation and impact the abundance and distribution of these species (Litt and Pearson 2013, Bachen 2014). In some areas of the Butte County and Two Rivers primary areas, we found widespread dense stands of sweet clover (*Melilotus officinalis*). This invasive species appeared to be displacing native vegetation and may be affecting wildlife, although further research is necessary to confirm its effects on invaded ecosystems. Management efforts that mitigate the invasion of nonnative plants are likely to conserve existing small mammal populations and associated species.

Arguably some of the most valuable data we collected from this project are observations of bat species. Bat populations in general have not been studied as closely as other taxa, and can be negatively impacted by both development of wind energy (Kunz et al. 2007)

and disease (Lorch et al. 2011). We found bat species within the study area to be most active during the warm season, with an apparent cessation of activity or migration out of the area between December and March. Winter bat roosts on the South Dakotas prairie habitats are likely absent or extremely rare. If they exist, identification and protection of those roosts is important. However, it is more likely that managers would be able to conserve bat species within this region by identifying and protecting summer roosts. Although general roost structures been documented for the species we observed (Kunz and Fenton 2006), little effort has been made to identify the specific types and importance of structures used in the Northern Great Plains, including South Dakota. Future efforts should be made to address this, including radio telemetry surveys and surveys of potential roost structures such as bridges and buildings. This and other information on bat species in this region would assist with mitigating potential impacts of wind energy development.

During this project we conducted visual encounter surveys of lentic waterbodies to detect breeding amphibians and aquatic reptiles, however due to logistical constraints we did not begin surveys until August, after some species had already metamorphosed and left breeding sites. Visual encounter surveys are valuable because they not only confirm breeding of amphibians, but unlike roadside calling surveys, they have the ability to detect amphibian species that either do not call or call softly as well as reptile species that use wetlands. Also by surveying during the breeding season for waterfowl and other water birds, surveys can provide valuable breeding records for these species. Therefore, we recommend future surveys starting in the late spring and early summer should be conducted to supplement the information we gathered with this project.

Prior to this effort, few baseline surveys for nongame species on BLM lands have been conducted and entered into the Montana Natural Heritage Program's databases. As past surveys documenting status and distribution of nongame species have likely been conducted in this area, further efforts should be made to incorporate existing structured survey data into the NHP database to increase availability of this data and aid in management of species across BLM managed lands in South Dakota.

This survey effort has increased the number of point observations in the Montana Natural Heritage Program's database by 40% to 4,122; increasing the number of observations for birds by 35%, mammals by 61%, amphibians by 2060%, and reptiles by 77%. Our surveys added 33 new bird species, including 4 that are BLM Sensitive: Brewers Sparrow (*Spizella breweri*), Burrowing Owl, Long-billed Curlew (*Numenius americanus*), and Sage Thrasher (*Oreoscoptes montanus*). This effort also add 6 mammal species, 4 amphibian species, including 2 South Dakota Rare, Threatened, or Endangered Animals (Great Plains Toad and Plains Spadefoot (*Spea bombifrons*)), and 3 reptile species, including the Greater Short-horned Lizard (*Phrynosoma hernandesi*) which is a South Dakota Rare, Threatened, or Endangered Animal (SDNHP 2014).

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APPENDIX A.

GLOBAL AND STATE RANK DEFINITION

Heritage Program Ranks

The international network of Natural Heritage Programs employs a standardized ranking system to denote global (range-wide) and state status. Species are assigned numeric ranks ranging from 1 to 5, reflecting the relative degree to which they are "at-risk". Rank definitions are given below. A number of factors are considered in assigning ranks — the number, size and distribution of known "occurrences" or populations, population trends (if known), habitat sensitivity, and threat. Factors in a species' life history that make it especially vulnerable are also considered (e.g., dependence on a specific pollinator).

GLOBAL RANK DEFINITIONS (NatureServe 2003)

G1	Critically imperiled because of extreme rarity and/or other factors making it highly vulnerable to extinction
G2	Imperiled because of rarity and/or other factors making it vulnerable to extinction
G3	Vulnerable because of rarity or restricted range and/or other factors, even though it maybe abundant at some of its locations
G4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery
G5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery
T1-5	Infraspecific Taxon (trinomial) —The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank

STATE RANK DEFINITIONS

S1	At high risk because of extremely limited and potentially declining numbers, extent and/or habitat, making it highly vulnerable to extirpation in the state
S2	At risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to extirpation in the state
S3	Potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas
S4	Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern
S5	Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range

COMBINATION RANKS

G#G# or S#S# Range Rank—A numeric range rank (e.g., G2G3) used to indicate uncertainty about the exact status of a taxon

Qualifiers

NR	Not ranked
Q	**Questionable taxonomy that may reduce conservation priority**—Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank
X	**Presumed Extinct**—Species believed to be extinct throughout its range. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered
H	**Possibly Extinct**—Species known from only historical occurrences, but may never-the less still be extant; further searching needed
U	**Unrankable**—Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends
HYB	**Hybrid**—Entity not ranked because it represents an interspecific hybrid and not a species
?	**Inexact Numeric Rank**—Denotes inexact numeric rank
C	**Captive or Cultivated Only**—Species at present is extant only in captivity or cultivation, or as a reintroduced population not yet established
A	**Accidental**—Species is accidental or casual in South Dakota, in other words, infrequent and outside usual range. Includes species (usually birds or butterflies) recorded once or only a few times at a location. A few of these species may have bred on the one or two occasions they were recorded
Z	**Zero Occurrences**—Species is present but lacking practical conservation concern in South Dakota because there are no definable occurrences, although the taxon is native and appears regularly in South Dakota
P	**Potential**—Potential that species occurs in Montana but no extant or historic occurrences are accepted

R	**Reported**—Species reported in South Dakota but without a basis for either accepting or rejecting the report, or the report not yet reviewed locally. Some of these are very recent discoveries for which the program has not yet received first-hand information; others are old, obscure reports
SYN	**Synonym**—Species reported as occurring in South Dakota, but the South Dakota Natural Heritage Program does not recognize the taxon; therefore the species is not assigned a rank
*	A rank has been assigned and is under review. Contact the South Dakota Natural Heritage Program for assigned rank
B	**Breeding**—Rank refers to the breeding population of the species in South Dakota
N	**Nonbreeding**—Rank refers to the non-breeding population of the species in South Dakota

APPENDIX B:

Echolocation Call Characteristics of Montana Bats

Echolocation Call Characteristics of Montana Bats[1]

	species	f_c	low f	high f	f_{max}	dur	Upper slope	Lower slope	Total slope	Diagnostic[2] and Special characteristics
50	***Myotis yumanensis***	**49.2**	**45.6**	**90.0**	**55.2**	**5.5**	**16.6**	**4.4**	**8.1**	Power focused around f_c; gradually builds up to peak and attenuates rapidly. Typically exhibit only a hint of a tail. **Pronounced knee, dur >6 ms, upprSlp <16, lwrSlp <3, f_c >44 kHz diagnostic within known range** (95% CI for MYLU)**. Sometimes insert longer duration calls within sequence of short duration calls.** Limited geographic range in MT (west of Continental Divide).
	Yuma Myotis	44.8-54.8	42.4-48.4	64.0-116.0	46.0-78.8	3.3-7.9	5.4-27.4	1.6-9.4	2.2-17.9	
	Myotis californicus	**49.1**	**45.3**	**99.6**	**52.8**	**3.8**	**28.0**	**7.4**	**15.1**	**FM sweep a smooth curve** (i.e., no inflection), beginning steeply and then increasing in curvature*. **Often a well defined downward tail. Sometimes a lower inflection; with the appearance of a "ledge" or "shelf" or "secondary change in slope" before f_c. Peak power of call typically persists for at least 1 ms on non–saturated calls. f_c >48 kHz diagnostic** (95% CI for MYCI). *some calls may have an inflection, but the smoothly curved variant is diagnostic.
	California Myotis	44.9-52.9	40.7-48.7	78.4-122.4	45.0-65.2	2.0-5.6	14.0-42	2.4-12.6	3.9-26.9	
40	***Myotis ciliolabrum***	**44.3**	**40.6**	**95.1**	**49.1**	**3.2**	**33.5**	**9.6**	**16.9**	**FM sweep a smooth curve** (i.e., no inflection), beginning steeply and then increasing in curvature*. **Often a well-defined downward tail. Peak power of call typically persists for at least 1 ms on non–saturated calls, f_c <45 kHz diagnostic if within MYCA geographic range** (95% CI for MYCA). *some calls may have an inflection, but the smoothly curved variant is diagnostic.
	Western Small-footed Myotis	39.7-47.7	37.4-43.4	76.9-112.9	42.9-54.9	1.8-4.6	20.5-46.5	4.4-14.4	7.1-27.1	

	Myotis septentrionalis Northern Long-eared Myotis	**43.2** 36.8-50.8	**37.0** 27.0-47.0	**104.0** 86.0-124.0	**51.3** 30.7-72.7	**3.9** 2.3-5.3	**24.2** 11.8-35.8	**11.7** 3.1-20.3	**18.6** 9.4-29.4	**Calls may have up to 100 kHz of bandwidth.** Shaped like MYEV or MYTH but distinguished by f_c. FM sweep may be nearly linear making f_c difficult to recognize. Quiet but consistent calls. **Presence in Montana uncertain - capture and genetic analysis needed to confirm ID.**
	Myotis volans Long-legged Myotis	**41.6** 36.4-46.4	**36.9** 31.1-43.1	**89.6** 66.4-112.4	**48.0** 39.0-60.0	**4.8** 2.4-7.0	**15.1** 6.9-22.9	**7.7** 1.1-14.3	**12.0** 4.0-22.0	**May exhibit an upward sweep into the call; uncommon, but diagnostic when present.** Generally has shorter, steeper calls than MYLU in open (uncluttered) areas. Note that alias harmonics may resemble upsweeps if sonogram is truncated (e.g. 96kHz maximum).
	Myotis lucifugus Little Brown Bat	**40.8** 37.2-43.2	**38.1** 33.9-41.9	**74.5** 51.5-97.5	**44.5** 36.0-53.5	**6.0** 3.2-8.6	**13.1** 2.7-26.9	**3.9** 0.8-9.1	**6.2** 1.6-13.8	Sometimes with multiple power centers making calls look clumpy. Can make the longest duration and lowest slope calls of all Myotis. **Dur >7 ms** (95% CI for MYVO) **and lwrSlp <3 diagnostic among 40 kHz Myotis; f_c <44 kHz diagnostic west of Continental Divide** (95% CI for MYYU).
	Lasiurus borealis Eastern Red Bat	**40.4** 31.6-47.6	**40.2** 33.8-45.8	**67.6** 40.4-94.4	**43.8** 34.2-54.2	**6.8** 3.2-11.4	**10.0** 0.1-22	**2.0** 0.0-4.4	**4.4** 0.1-9.8	**U-shaped calls; up-turn at end of call; may exhibit variable f_c across sequence.** Power smoothly centered in call. Typically ~40 kHz calls with dur >10 ms at LABO.
30	***Myotis evotis*** Long-eared Myotis	**34.3** 31.7-37.7	**28.1** 23.9-33.9	**78.5** 49.5-107.5	**39.1** 31.0-46.9	**3.7** 2.1-5.3	**20.5** 6.1-35.5	**8.7** 2.3-15.3	**13.5** 4.9-24.5	Calls may have up to 100 kHz of bandwidth. Shaped like MYTH and MYSE but distinguished by **f_c = 32-36** (upper range boundary for MYTH, 95% CIs for MYVO and MYSE). FM sweep may be nearly linear making f_c difficult to recognize. **Harmonics converge toward primary call component.**
	Eptesicus fuscus Big Brown Bat	**28.2** 25.8-31.8	**27.2** 24.8-30.8	**56.6** 43.4-69.4	**31.9** 25.0-40.1	**7.8** 2.8-12.2	**8.5** 2.5-15.5	**2.1** 0.3-4.3	**4.0** 0.6-7.6	Variable; calls with high f below 60 kHz can be confused with LANO. **Calls with high f >65 kHz distinguish from LANO** (high f range boundary for LANO)**, >12 ms to distinguish from ANPA where species coexist** (duration range boundary for ANPA)**;** even long calls have some FM component. Parallel harmonics.

	Antrozous pallidus	**28.0**	**26.2**	**54.5**	**31.0**	**6.8**	**8.1**	**2.7**	**4.3**	Often simple curved FM sweep, sometimes with knee in center. Distinguish from EPFU when **<6 calls/sec, but calculate this manually by looking for call intervals >180 ms for ≥1 second**. Note that MYTH & MYEV can also be <6 calls/sec. No tail. Parallel harmonics. **Presence of social calls diagnostic (see ref. calls).**
	Pallid Bat	26.0-30.0	23.8-29.8	41.5-67.5	25.0-37.0	3.8-10.0	3.0-15.9	0.6-5.1	2.1-7.9	
20	***Lasionycteris noctivagans***	**26.5**	**25.4**	**41.5**	**28.8**	**9.2**	**5.2**	**1.3**	**2.5**	Some call variants can be confused with EPFU. **Flat calls with f_c ≥26 kHz diagnostic.** Shorter calls reverse J–shaped; often with a **distinct inflection**. Parallel harmonics. Flat LACI calls are lower in f_c, but shorter LACI approach calls may overlap short LANO calls (examine entire sequence and call interval). Low slope calls with f_c = 25–26 kHz may be distinguished from LACI by the presence of an inflection. EPFU has more FM, typically with smooth curvature (no inflection), and high f >33 kHz (lower range boundary).
	Silver-haired Bat	25.5-27.5	22.6-28.6	26.0-58.5	24.0-33.2	2.3-16.8	0.0-12.6	0.0-3.7	0.0-6.7	
	Myotis thysanodes	**24.5**	**19.8**	**72.4**	**30.7**	**3.9**	**19.0**	**9.2**	**13.9**	Calls may have up to 100 kHz of bandwidth. Shaped like MYEV but distinguished by f_c. FM sweep may be nearly linear making f_c difficult to recognize. Want to have presence of harmonics to distinguish from COTO if high f <50 kHz. **Continuous steep shape and f_c down into the 20s is diagnostic: totalSlp >15, f_c <28 kHz, and low f <24 kHz diagnostic or totalSlp >10, f_c <28 kHz, and low f <24 kHz diagnostic if harmonics converge toward primary call component.**
	Fringed Myotis	21.5-27.5	14.2-24.2	41.6-103.6	24.0-39.3	1.9-5.9	7.1-33.0	3.1-16.8	4.9-24.1	

	Corynorhinus townsendii	**23.4**	**21.4**	**42.5**	**31.1**	**4.6**	**7.1**	**4.9**	**5.0**	Low intensity, difficult to detect; harmonics may be present. Call-shape **simple linear FM sweep**, (sometimes with upsweep or flat at onset - no knee or upward facing curvature toward end of call unless a connected squiggle). **Squiggle calls diagnostic (5-7 ms period).** f_{max} may alternate between primary call component and second harmonic. For search phase calls, COTO will have high f <50 kHz, f_c <32 kHz, and $f$max <41kHz (upper range boundaries). *Examine entire call sequence and look for upward facing curvature on any call; if found, likely not COTO. LACI and LANO approach calls and some linear MYTH fragments can mimic COTO.
	Townsend's Big-eared Bat	18.6-28.6	17.0-24.6	37.5-47.5	24.9-36.9	1.7-8.0	0.2-18.9	1.5-8.3	2.0-8.0	
	Lasiurus cinereus	**20.1**	**19.7**	**26.0**	**20.8**	**11.0**	**2.2**	**0.4**	**0.7**	**Pronounced or subtle U–shape;** very flat calls may have slight downturn into call or upturn at end. **Low f & f_c may vary across sequence**, **power builds toward center then gradually declines**. Short calls can be confused with LANO or EPFU. Typically f_c <23 kHz.
	Hoary Bat	16.0-23.9	16.3-24.3	17.0-36.0	17.0-25.2	4.0-19.0	0.1-6.0	0.0-1.2	0.0-2.1	
10	***Euderma maculatum***	**10**	**9.6**	**14.5**	**12.5**	**3.2**	**2.2**	**1.5**	**1.7**	**Simple linear FM sweep,** sometimes with a mild inflection. Short calls at low frequency. Harmonics often present, with second harmonic persisting beyond primary call component. **f_c = 7-10 kHz and dur = 3-8 ms diagnostic.**
	Spotted Bat	8.6-12.0	8.2-10.4	12.0-17.5	10.0-15.5	1.6-6.0	0.1-5.2	0.1-3.1	0.9-2.7	

[1] data from Humbolt State University Bat Lab (Eastern and Western US Bats 2011); numbers represent means and approximate 95% confidence intervals - if the 95% CI exceeded the observed range of a charcteristic, the range boundary was used.

[2] diagnostic characteristics for determination of species identification are bolded in text.

[3] filters and notes for internal use only; these represent work in progress or draft guidelines for limiting hand class efforts; seasonal range dates are from either definitively IDed calls (as of Nov 2014) or captures in POD but are not set in stone.

Important Characteristic/Sonogram Terminology[1]

Primary call: the component of an echolocation sound emitted by a bat with the lowest frequency, also called the fundamental; typically the most powerful and sometimes the only part of the call visible on a sonogram

Harmonic: multiple, typically subtle components of the call, existing at higher frequencies but roughly parallel to the primary call component; presence may indicate higher call quality unless a call is oversaturated

The characteristics below refer to attributes of the primary call. In rare cases, a harmonic may be the most powerful component of a call; these characteristics and their corresponding values in this key are not applicable to those measured from a harmonic component.

low *f*: lowest frequency (kHz)

high *f*: highest frequency (kHz)

f_c: characteristic frequency, the frequency of the call at its lowest slope (kHz)

f_{max}: the frequency where the power is greatest (kHz)

dur: duration (ms) from the start to the end of a call

Upper slope: the slope of the call (kHz/ms) between the high *f* and the knee; abbreviated: upprSlp

Lower slope: the slope of the call (kHz/ms) between the knee and the f_c; abbreviated: lwrSlp

Total slope: the slope of the call (kHz/ms) between the high *f* and the low *f*; abbreviated: totalSlp

Other terms used to describe calls:

FM: frequency modulation, change in frequency over time; most calls start at a high frequency and sweep down to a lower frequency

power: amplitude or sound energy (i.e. volume)

oversaturation: powerful calls may exceed the microphone/recorder capability and produce anomalies in the sonogram such as full spectrum "noise" (clipping) or alias harmonics (upside-down harmonics); peak power duration cannot be accurately estimated

inflection or knee: pronounced change in slope; some calls may not have an obvious knee if very steep or smoothly curved

flat: a call or portion of a call with very low or no slope (horizontal), i.e. constant frequency (CF)

sequence: a series of bat calls, produced as a bat flies past the detector

calls/sec: the number of calls per second for a given period; note that Sonobat's calculation of this characteristic may be incorrect due to multiple bats in a recording, low intensity calls, and dead air space in a sequence – ms between calls should be examined and calls should be looked at in real time to accurately estimate this characteristic if needed

Note that all frequencies should be interpreted as apparent or observed frequencies. These values may vary from the frequency emitted by the bat due to distance to detector (decreasing call power or volume). Call volume may have a noticeable effect on all frequencies recorded depending on the location of the power in the call (>5 kHz).

Call Types[2]

The values for the characteristics listed in this key are based on search phase calls. Therefore, it is important to make sure that search phase calls are examined and analyzed during hand classification.

Search phase calls: used for general navigation and searching in uncluttered areas, generally consistent call characteristics, approximately 3-12 calls per second; bats may be able to detect objects >10 meters away with these calls[3]

Approach phase calls: used when approaching either prey or a landing site or in cluttered airspace, such as when flying around vegetation; these calls are typically steeper and shorter than search calls and frequencies may shift up significantly, often 10-25 calls per second

Feeding buzz: also called terminal phase calls, used for close proximity object location during prey pursuit/capture, may exceed 100 calls per second[4]; very steep and short calls that can mimic other species if interpreted as search calls, but can be much lower in volume/power; not useful for species ID

Social calls: used to communicate with other bats, often lower in frequency than search phase calls for a species and may contain complex frequency modulation patterns; may be very helpful for identifying some species (e.g. ANPA) but are irregularly recorded

How to Use the Key for Montana Bats[1]

Tip: Put bat detector in an open, uncluttered environment so that it is more likely to detect bats using search phase calls.

1. Look at search phase calls (not approach calls, feeding buzzes, or social calls) within a sequence.
2. Choose noise free calls with harmonics so that you are more likely to see the whole call instead of just a portion. Note that some calls may be oversaturated if the bat closely approached the microphone and these should be avoided if possible.
3. Look at the entire sequence in both compressed and real time views. This will help you see the whole picture (Are there multiple bats? Feeding buzzes or other non-search phase calls?). This is particularly important differentiating EPFU vs. ANPA, MYLU vs. LABO, and for COTO in general since many other species may have calls that mimic COTO.
4. Look at the standard view for multiple calls within a sequence. BE AWARE that Sonobat sometimes identifies incorrect characteristics, analyzes strong harmonics instead of the primary call, and occasionally includes noise along with the primary call of interest.

[1] Adapted from Humbolt State University Bat Lab. 2011. Eastern and Western US Bat Keys.
[2] Reviewed in Fenton, M. B. 2013. Questions, ideas and tools: lessons from bat echolocation. Animal Behaviour 85, 869-879. Originally described in Griffin, D. R., et al. 1960. The echolocation of flying insects by bats. Animal Behaviour 8, 141-154.
[3] Fenton, M. B. 2004. Bat Natural History and Echolocation. *In* Brigham, R. M.,et al., eds. Bat Echolocation Research: tools, techniques, and analysis. Bat Conservation International, Austin, TX.
[4] Elemans, C., et al. 2011. Superfast Muscles Set Maximum Call Rate in Echolocating Bats. Science 333, 1885-1888.

APPENDIX C:

BASELINE STATUS INDICES OF DETECTED SPECIES: BIRD SURVEYS

BUTTE COUNTY PRIMARY AREA

Table C-1. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in mixedgrass prairie habitats surveyed on driving transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Mixedgrass Prairie (n = 48)	
	Proportion of points detected	Average number detected (SE)
American Kestrel	0.02	1 (*)
American Wigeon	0.04	2 (0)
Barn Swallow	0.31	1.87 (1.81)
Brown-Headed Cowbird	0.56	2 (1.52)
Brewer's Blackbird	0.02	1(*)
Blue-Winged Teal	0.06	1.67 (0.58)
Canada Goose	0.29	1.43 (0.65)
Chestnut-Collared Longspur +	0.4	2.47 (1.61)
Common Nighthawk	0.02	1 (*)
Eastern Kingbird	0.06	1.33 (0.58)
European Starling	0.02	1 (*)
Great Blue Heron	0.02	1 (*)
Golden Eagle +	0.02	1 (*)
Grasshopper Sparrow	0.52	2.08 (0.91)
Horned Lark	0.48	2.22 (1.31)
Killdeer	0.35	1.24 (0.44)
Lark Bunting	0.98	5.04 (2.50)
Lark Sparrow	0.04	1 (0)
Mallard	0.02	2 (*)
Mourning Dove	0.04	1 (0)
Northern Harrier	0.02	1 (*)
Red-Winged Blackbird	0.46	2.45 (1.65)
Short-Eared Owl	0.02	1 (*)
Spotted Sandpiper	0.02	1 (*)
Upland Sandpiper	0.52	1.56 (0.92)
Vesper Sparrow	0.58	1.57 (0.79)
Western Kingbird	0.06	1.33 (0.58)
Western Meadowlark	0.92	2.93 (1.47)
Wilson's Phalarope	0.15	1.71 (1.11)
Yellow-Headed Blackbird	0.02	2 (*)

Table C-2. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in riparian woodland habitats surveyed on walking transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Riparian Woodland (n = 13)	
	Proportion of points detected	Average number detected (SE)
American Kestrel	0.15	1 (0)
Bell's Vireo	0.08	1 (*)
Brown-Headed Cowbird	0.54	1.57 (1.51)
Black-Headed Grosbeak	0.15	1 (0)
Brewer's Blackbird	0.23	2.33 (0.58)
Brown Thrasher	0.08	2 (*)
Cedar Waxwing	0.15	1 (0)
Common Grackle	0.23	3.33 (2.52)
Common Nighthawk	0.08	1 (*)
Eastern Kingbird	0.46	2.17 (0.41)
European Starling	0.85	3.36 (1.29)
Hairy Woodpecker	0.08	1 (*)
House Wren	0.08	1 (*)
Killdeer	0.23	1.67 (1.15)
Lark Bunting	0.08	1 (*)
Loggerhead Shrike +	0.23	1.67 (0.58)
Mallard	0.15	1 (*)
Mourning Dove	0.92	3.17 (2.00)
Northern Flicker	0.54	1.14 (0.38)
Orchard Oriole	0.15	1 (0)
Red-Headed Woodpecker +	0.08	1 (*)
Red-Tailed Hawk	0.23	1 (0)
Red-Winged Blackbird	0.77	2.8 (1.75)
Turkey Vulture	0.08	1 (*)
Upland Sandpiper	0.38	1.2 (0.45)
Vesper Sparrow	0.15	1.5 (0.71)
Western Kingbird	0.31	1.5 (0.58)
Western Meadowlark	1	2.23 (0.83)
Willow Flycatcher	0.08	1 (*)
Yellow Warbler	0.31	1 (0)

NEWELL PRIMARY AREA

Table C-3. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in mixedgrass prairie habitats surveyed on driving transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Mixedgrass Prairie (n = 24)	
	Proportion of points detected	Average number detected (SE)
Barn Swallow	0.21	2 (1.73)
Brown-Headed Cowbird	0.67	1.88 (1.15)
Canada Goose	0.04	2 (*)
Chestnut-Collared Longspur +	0.08	2 (0)
Common Grackle	0.13	3.33 (3.21)
Common Nighthawk	0.08	1 (0)
Eastern Kingbird	0.13	1.33 (0.58)
European Starling	0.17	3 (1.41)
Ferruginous Hawk +	0.042	1 (*)
Golden Eagle +	0.08	1 (0)
Grasshopper Sparrow	0.67	2.31 (1.14)
Horned Lark	0.63	2.47 (1.41)
Killdeer	0.13	1.33 (0.58)
Lark Bunting	0.96	6.91 (3.27)
Lark Sparrow	0.13	1.33 (0.58)
Mallard	0.08	1.5 (0.71)
Mourning Dove	0.38	1.89 (1.05)
Northern Harrier	0.04	1 (*)
Northern Rough-Winged Swallow	0.13	2 (0)
Ring-Billed Gull	0.04	1 (*)
Red-Winged Blackbird	0.38	2.22 (2.39)
Sprague's Pipit +	0.04	2 (*)
Swainson's Hawk	0.08	1 (0)
Upland Sandpiper	0.21	1.4 (0.55)
Western Kingbird	0.17	1.25 (0.5)
Western Meadowlark	1	4.5 (1.67)
Wilson's Phalarope	0.04	1 (*)
Yellow-Headed Blackbird	0.04	2 (*)

Table C-4. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in mixedgrass prairie habitats surveyed on walking transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Mixedgrass Prairie (n = 29)	
	Proportion of points detected	Average number detected (SE)
Brown-Headed Cowbird	0.62	2.17 (1.25)
Bobolink +	0.1	1 (0)
Cliff Swallow	0.17	2 (1.22)
Common Nighthawk	0.03	1 (*)
Common Yellowthroat	0.07	1 (0)
Eastern Kingbird	0.07	1.5 (0.71)
European Starling	0.03	0 (*)
Grasshopper Sparrow	0.72	2.86 (1.15)
Horned Lark	0.55	2.94 (2.32)
Killdeer	0.14	1.75 (1.5)
Lark Bunting	0.79	4 (2.73)
Lark Sparrow	0.03	2 (*)
Long-Billed Curlew +	0.03	1 (*)
Loggerhead Shrike +	0.03	1 (*)
Mallard	0.17	1.2 (0.45)
Merlin	0.03	1 (*)
Mourning Dove	0.69	2.2 (1.01)
Ring-Billed Gull	0.07	1 (0)
Ring-Necked Pheasant	0.17	1.2 (0.45)
Red-Winged Blackbird	0.31	1.44 (0.73)
Upland Sandpiper	0.62	1.5 (0.62)
Western Meadowlark	1	5.45 (1.59)
Wild Turkey	0.14	1 (0)
Yellow Warbler	0.03	2 (*)
Yellow-Headed Blackbird	0.07	1 (0)

FORT MEADE PRIMARY AREA

Table C-5. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in riparian woodland, mixedgrass prairie, and coniferous woodland habitats surveyed on driving transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Riparian Woodland (n = 5)		Mixedgrass Prairie (n = 12)		Coniferous Woodland (n = 7)	
	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)
American Coot	0	0	0.08	3 (*)	0	0
American Crow	0.6	1 (0)	0.08	1 (*)	0.29	1.5 (0.71)
American Goldfinch	0.2	1 (*)	0	0	0	0
American Robin	0.6	2 (1)	0	0	0.57	3 (0.82)
American White Pelican	0.2	1 (*)	0	0	0.14	1 (*)
Barn Swallow	0	0	0.33	1.25 (0.5)	0	0
Black-Capped Chickadee	0.4	2 (1.41)	0.08	1 (*)	0.43	1.33 (0.58)
Black-Headed Grosbeak	0.4	1 (0)	0	0	0.14	1 (*)
Blue Jay	0.4	1.5 (0.71)	0.08	1 (*)	0.14	1 (*)
Bobolink	0	0	0.58	2.71 (2.06)	0.14	1 (*)
Brewer's Blackbird	0.2	4 (*)	0.25	1 (0)	0.14	1 (*)
Brown-Headed Cowbird	0	0	0.5	2.83 (3.06)	0.71	1.6 (0.89)
Canada Goose	0	0	0.08	1 (*)	0	0
Chipping Sparrow	0.2	1 (*)	0	0	0.29	1.5 (0.71)
Common Grackle	0	0	0.08	1 (*)	0.29	1 (0)
Dark-Eyed Junco	0	0	0	0	0.14	1 (*)
Dusky Flycatcher	0.2	1 (*)	0	0	0	0
Eastern Kingbird	0	0	0.25	1 (0)	0.14	2 (*)
European Starling	0	0	0.08	3 (*)	0	0
Field Sparrow	0.6	1.33 (0.58)	0.17	1.5 (0.71)	0.14	2 (*)
Great Blue Heron	0	0	0.17	1 (0)	0	0
Grasshopper Sparrow	0	0	0.33	1.75 (0.96)	0.29	1 (0)
Horned Lark	0.2	1 (*)	0.08	2 (*)	0	0
Killdeer	0	0	0.08	1 (*)	0	0
Loggerhead Shrike +	0	0	0.08	2 (*)	0	0
Mallard	0	0	0.08	1 (*)	0	0
Mountain Bluebird	0	0	0	0	0.14	1 (*)
Mourning Dove	0.4	1.5 (0.71)	0.5	2.17 (1.17)	0.29	1 (0)
Northern Flicker	0.2	1 (*)	0	0	0.14	1 (*)
Plumbeous Vireo	0	0	0	0	0.14	1 (*)
Ring-Billed Gull	0	0	0.17	2.5 (0.71)	0	0
Red-Breasted Nuthatch	0.2	1 (*)	0.08	1 (*)	0.43	1.33 (0.58)
Red-Eyed Vireo	0.2	1 (*)	0	0	0	0

Species	Riparian Woodland (n = 5)		Mixedgrass Prairie (n = 12)		Coniferous Woodland (n = 7)	
	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)
Red-Winged Blackbird	0	0	0.75	3.56 (2.4)	0	0
Rock Pigeon	0	0	0	0	0.14	2 (*)
Spotted Towhee	0	0	0	0	0.43	2.67 (1.53)
Tree Swallow	0.4	4 (2.83)	0.08	2 (*)	0.14	2 (*)
Turkey Vulture	0	0	0.17	1 (0)	0	0
Upland Sandpiper	0	0	0.08	1 (*)	0	0
Vesper Sparrow	0	0	0.08	1 (*)	0	0
Western Meadowlark	0.2	1 (*)	0.92	2.64 (1.21)	0.43	3.33 (2.08)
Western Tanager	0.4	1.5 (0.71)	0	0	0	0
Western Wood-Pewee	0	0	0.08	1 (*)	0	0
White-Breasted Nuthatch	0	0	0	0	0.14	1 (*)
Wild Turkey	0.2	1 (*)	0	0	0.14	1 (*)
Wilson's Snipe	0	0	0.17	1.5 (0.71)	0	0
Yellow Warbler	0.2	4 (*)	0	0	0	0

LEAD PRIMARY AREA

Table C-6. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in coniferous woodland habitats surveyed on walking transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Coniferous Woodland (n = 10)	
	Proportion of points detected	Average number detected (SE)
American Crow	0.1	1 (*)
American Robin	0.8	1.88 (0.83)
Black-Capped Chickadee	0.5	1.4 (0.89)
Cedar Waxwing	0.1	1 (*)
Common Yellowthroat	0.1	1 (*)
Dark-Eyed Junco	0.2	1 (0)
Ovenbird	0.3	1 (0)
Red-Breasted Nuthatch	0.6	1.33 (0.52)
Ruby-Crowned Kinglet	0.9	2.22 (1.30)
Red-Naped Sapsucker	0.2	1 (0)
Song Sparrow	0.4	1.25 (0.5)
Spotted Towhee	0.1	1 (*)
Swainson's Thrush	0.2	1 (0)
Tree Swallow	0.1	1 (*)
Yellow Warbler	0.2	2 (1.41)
Yellow-Rumped Warbler	0.5	1.6 (0.55)

SOUTHERN BLACK HILLS PRIMARY AREA

Table C-7. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in coniferous woodland, mixedgrass prairie, and riparian woodland habitats surveyed on driving transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Coniferous Woodland (n = 6)		Mixedgrass Prairie (n = 5)		Riparian Woodland (n = 1)	
	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)
American Crow	0.17	1 (*)	0.2	1 (*)	0	0
American Goldfinch	0	0	0.2	1 (*)	0	0
American Robin	0.33	1.5 (0.71)	0.2	1 (*)	0	0
Black-Capped Chickadee	0.33	1 (0)	0	0	0	0
Brown-Headed Cowbird	0.33	1 (0)	0.4	1 (0)	0	0
Cedar Waxwing	0.17	4 (*)	0	0	0	0
Chipping Sparrow	0.5	1.67 (1.15)	0.2	1 (*)	0	0
Common Nighthawk	0.17	1 (*)	0	0	0	0
Eastern Kingbird	0	0	0.2	1 (*)	0	0
European Starling	0	0	0	0	1	2 (*)
Grasshopper Sparrow	0	0	0.6	1.33 (0.58)	0	0
House Wren	0.17	1 (*)	0.2	1 (*)	0	0
Lark Bunting	0	0	0.4	1.5 (0.71)	1	2 (*)
Lark Sparrow	0.67	1.75 (1.5)	0.2	1 (*)	0	0
Lazuli Bunting	0	0	0.2	1 (*)	0	0
Mountain Bluebird	0	0	0.4	1.5 (0.71)	0	0
Mourning Dove	0.83	3.4 (1.67)	0.8	6.25 (5.68)	0	0
Northern Flicker	0.17	1 (*)	0	0	0	0
Rock Wren	0.33	3 (0)	0.2	1 (*)	0	0
Red-Winged Blackbird	0.17	3 (*)	0.2	1 (*)	1	1 (*)
Spotted Towhee	0.83	1.6 (0.89)	0.6	1.67 (1.15)	0	0
Upland Sandpiper	0.17	1 (*)	0	0	0	0
Vesper Sparrow	0.33	1 (0)	0	0	0	0
Western Meadowlark	1	2.83 (1.17)	1	3.2 (1.48)	1	5(*)
Yellow Warbler	0	0	0	0	1	1 (*)

Table C-8. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in coniferous woodland, mixedgrass prairie, and riparian woodland habitats surveyed on walking transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Coniferous Woodland (n = 14)		Mixedgrass Prairie (n = 6)		Riparian Woodland (n = 1)	
	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)
American Crow	0.07	2 (*)	0.17	1 (*)	0	0
American Goldfinch	0.07	1 (*)	0	0	0	0
American Robin	0.5	1.71 (0.95)	0.33	1 (0)	1	2 (*)
American White Pelican	0.07	1 (*)	0	0	1	1 (*)
Black-Capped Chickadee	0.36	1.6 (0.55)	0.17	1 (*)	0	0
Brown-Headed Cowbird	0.36	2 (1.41)	0.33	2 (1.41)	0	0
Chipping Sparrow	0.64	2.22 (0.94)	0.33	1.5 (0.71)	0	0
Common Nighthawk	0	0	0.17	1 (*)	0	0
Eastern Kingbird	0.14	1 (0)	0	0	0	0
Field Sparrow	0.07	1 (*)	0	0	0	0
Gray Catbird	0.07	1 (*)	0	0	0	0
Grasshopper Sparrow	0.07	1 (*)	0.5	1.67 (0.58)	0	0
House Wren	0.36	2.22 (0.45)	0.17	1 (*)	0	0
Horned Lark	0	0	0.17	3 (*)	0	0
Lark Sparrow	0.64	2.22 (0.97)	0.5	1.33 (0.58)	0	0
Lazuli Bunting	0	0	0.17	1 (*)	0	0
Mountain Bluebird	0.07	3 (*)	0.17	1 (*)	0	0
Mourning Dove	0.57	2.13 (0.99)	0.67	2.75 (0.96)	1	3 (*)
Northern Flicker	0.21	1 (0)	0.17	1 (*)	0	0
Ovenbird	0.07	1 (*)	0	0	0	0
Red-Breasted Nuthatch	0.07	1 (*)	0	0	0	0
Red-Eyed Vireo	0	0	0.17	1 (*)	0	0
Rock Wren	0.07	1 (*)	0	0	0	0
Song Sparrow	0.21	1.67 (0.58)	0	0	0	0
Spotted Towhee	0.71	1.5 (0.97)	0.17	1 (*)	1	2 (*)
Tree Swallow	0.21	1 (0)	0	0	0	0
Upland Sandpiper	0	0	0.17	2 (*)	0	0
Vesper Sparrow	0.14	1.5 (0.71)	0.33	1.5 (0.71)	0	0
Western Meadowlark	0.71	2.6 (1.58)	1	2.5 (1.05)	0	0
Western Tanager	0.07	1 (*)	0.17	1 (*)	0	0
Willow Flycatcher	0.07	1 (*)	0	0	0	0
Yellow Warbler	0.21	1 (0)	0.17	2 (*)	1	2 (*)

PEDRO PRIMARY AREA

Table C-9. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in mixedgrass prairie, riparian woodland, and coniferous woodland habitats surveyed on driving transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Mixedgrass Prairie (n = 8)		Riparian Woodland (n = 3)		Coniferous Woodland (n = 5)	
	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)
American Crow	0.5	1.5 (1)	0.67	1 (0)	0.4	1 (0)
American Kestrel	0.13	1 (*)	0.33	1 (*)	0	0
Bald Eagle +	0.13	1 (*)	0	0	0	0
Barn Swallow	0.38	3 (2.65)	0.33	1 (*)	0	0
Black-Billed Magpie	0.25	1 (0)	0	0	0.2	1 (*)
Brown-Headed Cowbird	0.75	5 (7.43)	0.67	1 (0)	1	1.4 (0.55)
Blue Grosbeak	0.25	1 (0)	0	0	0.4	2 (1.41)
American White Pelican	0	0	0.33	1 (*)	0	0
Bobolink	0.13	1 (*)	0.33	1 (*)	0	0
Burrowing Owl +	0.13	1 (*)	0	0	0	0
Chipping Sparrow	0	0	0	0	0.6	2 (0)
Common Grackle	0.38	1.67 (0.58)	0.33	1 (*)	0.2	1 (*)
Common Yellowthroat	0	0	0.33	1 (*)	0	0
Dickcissel	0.25	2 (0)	0.67	4 (0)	0	0
European Starling	0.13	4 (*)	0.33	1 (*)	0	0
Field Sparrow	0	0	0	0	0.2	3 (*)
Great Blue Heron	0.25	1 (0)	0	0	0.2	2 (*)
Golden Eagle +	0.13	1 (*)	0	0	0	0
Grasshopper Sparrow	0.13	1 (*)	0.33	2 (*)	0.2	1 (*)
Horned Lark	0.13	6 (*)	0	0	0	0
House Wren	0.25	1 (0)	0	0	0.2	3 (*)
Lark Bunting	0.13	1 (*)	0	0	0	0
Lark Sparrow	0.13	2 (*)	0.67	2 (1.41)	0.6	2 (1.73)
Mourning Dove	1	3.88 (1.96)	1	5.33 (1.53)	1	2.4 (1.14)
Northern Flicker	0.13	1 (*)	0.33	1 (*)	0.2	1 (*)
N. Rough-Winged	0	0	0	0	0.2	2 (*)
Ring-Necked Pheasant	0.5	1 (0)	0.67	1 (0)	0	0
Red-Winged Blackbird	0.88	2.14 (1.46)	0.33	1 (*)	0.2	1 (*)
Spotted Towhee	0.13	1 (*)	0	0	0.8	2 (0.82)
Tree Swallow	0.25	1 (0)	0.33	2 (*)	0	0
Turkey Vulture	0.13	1 (*)	0	0	0	0
Upland Sandpiper	0.5	1 (0)	0.33	2 (*)	0.2	1 (*)
Western Kingbird	0.13	2 (*)	0	0	0.2	1 (*)
Western Meadowlark	1	2.88 (0.64)	1	4 (*)	1	2.8 (1.3)
Wild Turkey	0.25	1.5 (0.71)	0	0	0	0
Yellow Warbler	0	0	0.33	1 (*)	0	0

Table C-10. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in mixedgrass prairie and coniferous woodland habitats surveyed on walking transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Mixedgrass Prairie (n = 7)		Coniferous Woodland (n = 23)	
	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)
American Crow	0.71	1.6 (0.89)	0.57	1.230769
American Goldfinch	0	0	0.26	2 (1.55)
American Robin	0	0	0.09	1 (0)
American White Pelican	0.14	2 (*)	0	0
Black-Billed Magpie	0.29	1.5 (0.71)	0.39	1.44 (0.53)
Black-Capped Chickadee	0.14	1 (*)	0.3	1.29 (0.49)
Blue Grosbeak	0.43	1.33 (0.58)	0	0
Blue Jay	0	0	0.04	1 (*)
Brown-Headed Cowbird	0.57	1.25 (0.5)	0.91	3.33 (3.51)
Brown Thrasher	0	0	0.13	1.33 (0.58)
Cedar Waxwing	0	0	0.09	1.5 (0.71)
Chipping Sparrow	0.14	1 (*)	0.09	1 (0)
Common Grackle	0.14	1 (*)	0.04	2 (*)
Eastern Kingbird	0.14	1 (*)	0	0
Field Sparrow	0.86	1.33 (0.82)	0.74	1.94 (1.09)
Golden Eagle +	0	0	0.09	1 (0)
Grasshopper Sparrow	0.14	1 (*)	0	0
Great Blue Heron	0	0	0.04	2 (*)
House Wren	0	0	0.09	1.5 (0.71)
Killdeer	0.14	2 (*)	0	0
Lark Sparrow	0.86	3.67 (1.97)	0.09	2.5 (1.54)
Long-Billed Curlew +	0.14	1 (*)	0	0
Merlin	0	0	0.04	1 (*)
Mourning Dove	0.86	4.83 (3.06)	0.96	2.91 (1.69)
Northern Flicker	0.14	4 (*)	0.04	1 (*)
Northern Rough-Winged	0.14	2 (*)	0.22	2.2 (1.64)
Orchard Oriole	0	0	0.04	2 (*)
Ring-Necked Pheasant	0.14	1 (*)	0.09	1 (0)
Red-Winged Blackbird	0.14	1 (*)	0	0
Rock Wren	0	0	0.09	1 (0)
Spotted Towhee	0.29	1.5 (0.71)	0.74	1.82 (0.73)
Turkey Vulture	0	0	0.04	3 (*)
Upland Sandpiper	0	0	0.09	1 (0)
Western Kingbird	0	0	0.04	1 (*)
Western Meadowlark	0.71	2.4 (0.89)	0.39	1.67 (0.71)
Yellow-Breasted Chat	0	0	0.13	1.33 (0.58)
Yellow Warbler	0	0	0.09	1.5 (0.71)

MISSION RIDGE PRIMARY AREA

Table C-11. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in mixedgrass prairie and riparian woodland habitats surveyed on driving transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Mixedgrass Prairie (n = 23)		Riparian Woodland (n = 1)	
	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)
Barn Swallow	0.13	1.67 (1.15)	1	1 (*)
Bell's Vireo	0	0	1	1 (*)
Bobolink	0.17	1.5 (0.58)	0	0
Brown-headed Cowbird	0.91	3.81 (2.86)	0	0
Brown Thrasher	0	0	1	3 (*)
Burrowing Owl +	0.04	1 (*)	0	0
Common Grackle	0.13	1.67 (0.58)	0	0
Common Nighthawk	0.04	1 (*)	1	1 (*)
Dickcissel	0.65	2.2 (1.37)	1	1 (*)
Eastern Kingbird	0.04	1 (*)	1	1 (*)
Gadwall	0.04	2 (*)	0	0
Great Blue Heron	0.04	1 (*)	0	0
Grasshopper Sparrow	0.43	1.6 (0.70)	0	0
Horned Lark	0.43	1.8 (1.23)	0	0
Killdeer	0.09	1 (0)	0	0
Lark Bunting	0.96	4.01 (2.29)	0	0
Long-Billed Curlew +	0.09	1 (0)	0	0
Mallard	0.26	2.67 (2.73)	1	2 (*)
Mourning Dove	0.43	2.8 (2.86)	1	2 (*)
Northern Pintail	0.04	1 (*)	0	0
Orchard Oriole	0.04	1 (*)	0	0
Ring-Necked Pheasant	0.35	1.25 (0.46)	1	1 (*)
Red-Winged Blackbird	0.74	2.65 (1.93)	1	12 (*)
Spotted Towhee	0	0	1	1 (*)
Upland Sandpiper	0.48	1.36 (0.92)	1	2 (*)
Western Kingbird	0.04	1 (*)	0	0
Western Meadowlark	0.96	3.41 (1.56)	0	0
Yellow Warbler	0	0	1	1 (*)

TWO RIVERS PRIMARY AREA

Table C-12. Proportion of points where bird species were detected and average number (SE) of birds detected at those points in coniferous woodland, badlands, riparian woodland, and mixedgrass prairie habitats surveyed on walking transects. Species denoted by + are listed as BLM Sensitive. Standard errors could not be calculated for SE values denoted with a *.

Species	Coniferous Woodland (n = 14)		Badlands (n = 10)		Riparian Woodland (n = 1)		Mixedgrass Prairie (n = 2)	
	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)	Proportion of points detected	Average number detected (SE)
American Crow	0.29	1 (0)	0.2	1.5 (0.71)	0	0	0	0
American Goldfinch	0.14	1.5 (0.71)	0	0	0	0	0	0
American Kestrel	0.07	1 (*)	0.1	1 (*)	0	0	0	0
American Robin	0	0	0.1	1 (*)	0	0	0	0
Black-Billed Magpie	0.14	1.5 (0.71)	0.4	2 (0.82)	1	1 (*)	1	4 (2.83)
Blue-Gray Gnatcatcher +	0.07	1 (*)	0	0	0	0	0	0
Brown-Headed Cowbird	0.71	3 (1.56)	0.7	4.86 (4.95)	1	3 (*)	0.5	2 (*)
Blue Grosbeak	0.36	1.4 (0.89)	0.1	1 (*)	0	0	0	0
Blue Jay	0.07	1 (*)	0	0	0	0	0	0
Brown Thrasher	0.07	1 (*)	0	0	0	0	0	0
Canyon Wren	0.07	1 (*)	0	0	0	0	0	0
Cedar Waxwing	0.07	7 (*)	0.1	3 (*)	0	0	0	0
Chipping Sparrow	0.07	1 (*)	0	0	0	0	0	0
Common Nighthawk	0	0	0.1	1 (*)	0	0	0.5	1 (*)
Eastern Bluebird	0.07	1 (*)	0	0	0	0	0	0
Eastern Kingbird	0.07	1 (*)	0.1	1 (*)	0	0	0	0
Field Sparrow	0.86	1.83 (0.72)	0.8	1.38 (0.52)	1	1 (*)	1	1 (0)
Grasshopper Sparrow	0	0	0	0	0	0	1	2 (0)
Horned Lark	0	0	0.1	1 (*)	0	0	0	0
Killdeer	0.07	1 (*)	0.1	1 (*)	0	0	0	0
Lark Bunting	0.14	1 (0)	0.2	13 (15.56)	0	0	0	0
Lark Sparrow	1	2.71 (1.38)	1	2.2 (1.03)	0	0	0.5	1 (*)
Mourning Dove	0.93	2.23 (1.48)	1	2.3 (0.95)	1	2 (*)	1	1.5 (0.71)
Northern Rough-Winged Swallow	0.21	2.33 (1.53)	0.7	1.29 (0.76)	0	0	0.5	3 (*)
Rock Wren	0.29	1.75 (0.5)	0.1	1 (*)	0	0	0.5	2 (*)
Red-Winged Blackbird	0.07	4 (*)	0	0	0	0	0	0
Spotted Towhee	0.5	1.86 (1.07)	0.4	1.25 (0.5)	1	1 (*)	1	1 (0)
Upland Sandpiper	0.14	1 (0)	0	0	1	2 (*)	0.5	1 (*)
Western Kingbird	0	0	0.1	1 (*)	0	0	0	0
Western Meadowlark	1	2.71 (1.20)	0.9	3.67 (1.5)	1	6 (*)	1	3.5 (0.71)
Yellow-Breasted Chat	0	0	0.1	1 (*)	0	0	0	0

APPENDIX D

BASELINE STATUS INDICES OF DETECTED SPECIES: SMALL MAMMAL SURVEYS

BUTTE COUNTY PRIMARY AREA

Table D-1. Proportion of traplines each species was captured on within mixedgrass prairie, barren, herbaceous wetland, and shrubland habitats.

Species	Mixedgrass Prairie (n =6)	Barren (n = 1)	Herbaceous Wetland (n = 1)	Shrubland (n = 3)
Shrew Spp.	0	0	0	0.33
Thirteen-lined Ground Squirrel	0.17	0	0	0.33
Meadow Vole	0	0	1	0
Northern Grasshopper Mouse	0.17	0	0	0.33
Deer Mouse	0.33	1	0	1
Western Harvest Mouse	0	0	0	0.33

Table D-2. Proportion of museum special (MS), Sherman (SH), Victor (V), and pitfall (P) traps where small mammal species were detected within mixedgrass prairie, barren, herbaceous wetland, and shrubland habitats. Sample sizes of traps are shown in parentheses.

Species	Mixedgrass Prairie (n =6)				Barren (n = 1)				Herbaceous Wetland (n =1)				Shrubland (n =3)			
	MS (n=164)	SH (n=177)	V (n=168)	P (n=180)	MS (n=28)	SH (n=29)	V (n=27)	P (n=30)	MS (n=26)	SH (n=30)	V (n=27)	P (n=29)	MS (n=75)	SH (n=87)	V (n=86)	P (n=90)
Deer Mouse	0.04	<0.01	0.04	0	0.07	0	0	0	0	0	0	0	0.08	0.01	0.06	0
Meadow vole	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0	0
Northern Grasshopper Mouse	<0.01	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0
Thirteen-lined Ground Squirrel	<0.01	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0	0
Shrew spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01
Western Harvest Mouse	0	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0	0

NEWELL PRIMARY AREA

Table D-3. Proportion of traplines each species was captured on within mixedgrass prairie habitat.

Species	Mixedgrass Prairie (n = 6)
Deer Mouse	1
Western Harvest Mouse	0.17
Plains Harvest Mouse	0.17

Table D-4. Proportion of museum special (MS), Sherman (SH), Victor (V), and pitfall (P) traps where small mammal species were detected within mixedgrass prairie habitat. Sample sizes of traps are shown in parentheses.

Species	Mixedgrass Prairie (n = 6)			
	MS (n=147)	**SH** (n=152)	**V** (n=151)	**P** (n=158)
Deer Mouse	0.07	0.01	0.01	0
Western Harvest Mouse	0.01	0	0	0
Plains Harvest Mouse	0	0	0.01	0

FORT MEADE PRIMARY AREA

Table D-5. Proportion of traplines each species was captured on within mixedgrass prairie, herbaceous wetland, deciduous woodland, and coniferous woodland habitats.

Species	Mixedgrass Prairie (n = 1)	Herbaceous Wetland (n = 1)	Deciduous Woodland (n = 2)	Coniferous Woodland (n = 1)
Deer Mouse	1	1	1	1
White-footed Mouse	0	0	1	1
Prairie Vole	1	1	0.5	0
Meadow Vole	0	1	0.5	0

Table D-6. Proportion of museum special (MS), Sherman (SH), Victor (V), and pitfall (P) traps where small mammal species were detected within mixedgrass prairie, herbaceous wetland, deciduous woodland, and coniferous woodland habitats. Sample sizes of traps are shown in parentheses.

Species	Mixedgrass Prairie (n = 1)				Herbaceous Wetland (n = 1)				Deciduous Woodland (n = 2)				Coniferous Woodland (n = 1)			
	MS (n=22)	SH (n=29)	V (n=28)	P (n=30)	MS (n=24)	SH (n=26)	V (n=25)	P (n=29)	MS (n=48)	SH (n=56)	V (n=48)	P (n=60)	MS (n=22)	SH (n=27)	V (n=25)	P (n=30)
Deer Mouse	0.09	0.14	0.11	0	0.08	0	0	0	0.12	0.02	0.04	0	0	0	0.04	0
White-footed Mouse	0	0	0	0	0	0	0	0	0.27	0.11	0.12	0	0.09	0	0	0
Prairie Vole	0.41	0.03	0.07	0.03	0.04	0.04	0	0	0.02	0	0	0	0	0	0	0
Meadow Vole	0	0	0	0	0.04	0.04	0	0.07	0	0.02	0	0	0	0	0	0

LEAD PRIMARY AREA

Table D-7 Proportion of traplines each species was captured on within coniferous woodland, wet meadow, and woody wetland habitats.

Species	Coniferous Woodland (n = 3)	Wet Meadow (n = 1)	Woody Wetland (n = 1)
Masked Shrew	0.33	1	1
Red-backed Vole	1	0	0
Long-tailed Vole	0.67	0	0
Meadow Vole	0.67	1	1
Deer Mouse	0.67	0	1
White-footed Mouse	0	0	1
Least Chipmunk	0.33	0	0

Table D-8. Proportion of museum special (MS), Sherman (SH), Victor (V), and pitfall (P) traps where small mammal species were detected within coniferous woodland, wet meadow, and woody wetland habitats. Sample sizes of traps are shown in parentheses.

Species	Coniferous Woodland (n = 3)				Wet Meadow (n = 1)				Woody Wetland (n = 1)			
	MS (n=82)	SH (n=86)	V (n=85)	P (n=90)	MS (n=24)	SH (n=30)	V (n=26)	P (n=30)	MS (n=27)	SH (n=30)	V (n=30)	P (n=30)
Masked Shrew	0	0	0.01	0	0.04	0	0	0.07	0.07		0.03	0
Red-backed Vole	0.09	0.03	0.04	0	0	0	0	0	0	0	0	0
Long-tailed Vole	0.04	0	0.04	0	0	0	0	0	0	0	0	0
Meadow Vole	0.02	0	0	0	0.12	0	0.08	0	0.04	0.03	0.07	0
Deer Mouse	0.04	0.01	0.01	0	0	0	0	0	0.19	0.10	0.03	0
White-footed Mouse	0	0	0	0	0	0	0	0	0.04	0	0	0
Least Chipmunk	0	0	0.01	0	0	0	0	0	0	0	0	0

SOUTHERN BLACK HILLS PRIMARY AREA

Table D-9. Proportion of traplines each species was captured on within mixedgrass prairie and coniferous woodland habitats.

Species	Mixedgrass Prairie (n = 3)	Coniferous Woodland (n = 2)
Hispid Pocket Mouse	0.66	0
Prairie Vole	0.33	0.5
Deer Mouse	0	1
Plains Harvest Mouse	0.33	0

Table D-10. Proportion of museum special (MS), Sherman (SH), Victor (V), and pitfall (P) traps where small mammal species were detected within mixedgrass prairie and coniferous woodland habitats. Sample sizes of traps are shown in parentheses.

Species	Mixedgrass Prairie (n = 3)				Coniferous Woodland (n = 2)			
	MS (n=83)	SH (n=84)	V (n=83)	P (n=84)	MS (n=57)	SH (n=57)	V (n=57)	P (n=57)
Hispid Pocket Mouse	0	0	0.02	0	0	0	0	0
Prairie Vole	0.01	0	0	0	0.02	0	0	0
Deer Mouse	0	0	0	0	0.11	0.05	0.05	0
Plains Harvest Mouse	0.01	0	0	0	0	0	0	0

PEDRO PRIMARY AREA

Table D-11. Proportion of traplines each species was captured on within shrubland, coniferous woodland, and mixedgrass prairie habitats.

Species	Shrubland (n = 2)	Coniferous Woodland (n = 2)	Mixedgrass Prairie (n = 1)
Prairie Vole	0.5	0	1
Deer Mouse	1	1	1
White-footed Mouse	0.5	1	1
Plains Harvest Mouse	0	0	1

Table D-12. Proportion of museum special (MS), Sherman (SH), Victor (V), and pitfall (P) traps where small mammal species were detected within shrubland, coniferous woodland, and mixedgrass prairie habitats. Sample sizes of traps are shown in parentheses.

Species	Shrubland (n = 2)				Coniferous woodland (n = 2)				Mixedgrass prairie (n = 1)			
	MS (n=52)	SH (n=53)	V (n=53)	P (n=60)	MS (n=53)	SH (n=59)	V (n=53)	P (n=60)	MS (n=23)	SH (n=25)	V (n=22)	P (n=30)
Prairie Vole	0.04	0	0	0	0	0	0	0	0	0	0.05	0
Deer Mouse	0.08	0.02	0.04	0	0.08	0	0.04	0	0.04	0	0	0
White-footed Mouse	0.02	0	0	0	0.11	0.02	0	0	0	0	0.05	0
Plains Harvest Mouse	0	0	0	0	0	0	0	0	0.04	0	0	0

MISSION RIDGE PRIMARY AREA

Table D-13. Proportion of traplines each species was captured on within mixedgrass prairie, barren, and shrubland habitats.

Species	Mixedgrass Prairie (n = 3)	Barren (n = 1)	Shrubland (n = 1)
Least Shrew	0.33	0	0
Deer Mouse	0.67	1	0
White-footed Mouse	0.33	1	1

Table D-14. Proportion of museum special (MS), Sherman (SH), Victor (V), and pitfall (P) traps where small mammal species were detected within mixedgrass prairie, barren, and shrubland habitats. Sample sizes of traps are shown in parentheses.

Species	Mixedgrass Prairie (n = 3)				Barren (n = 1)				Shrubland (n = 1)			
	MS (n=75)	SH (n=85)	V (n=85)	P (n=90)	MS (n=24)	SH (n=30)	V (n=30)	P (n=29)	MS (n=29)	SH (n=28)	V (n=30)	P (n=30)
Least Shrew	0	0	0	0.01	0	0	0	0	0	0	0	0
Deer Mouse	0.07	0	0.06	0	0.33	0.03	0.03	0	0	0	0	0
White-footed Mouse	0	0.01	0	0	0.04	0	0	0	0.03	0	0.03	0.03

TWO RIVERS PRIMARY AREA

Table D-15. Proportion of traplines each species was captured on within barren, coniferous woodland, and mixedgrass prairie habitats.

Species	Barren (n = 1)	Coniferous Woodland (n = 2)	Mixedgrass Prairie (n = 2)
Hispid Pocket Mouse	0	0.5	0.5
Prairie Vole	0	0.5	0
Deer Mouse	1	1	1
White-footed Mouse	1	0.5	0
Plains Harvest Mouse	1	0	0

Table D-16. Proportion of museum special (MS), Sherman (SH), Victor (V), and pitfall (P) traps where small mammal species were detected within barren, coniferous woodland, and mixedgrass prairie habitats. Sample sizes of traps are shown in parentheses.

Species	Barren (n = 1)				Coniferous Woodland (n = 2)				Mixedgrass Prairie (n = 2)			
	MS (n=25)	SH (n=29)	V (n=27)	P (n=30)	MS (n=56)	SH (n=60)	V (n=59)	P (n=60)	MS (n=55)	SH (n=58)	V (n=55)	P (n=60)
Hispid Pocket Mouse	0	0	0	0	0	0.02	0	0	0	0.02	0.02	0
Prairie Vole	0	0	0	0	0.02	0	0	0	0	0	0	0
Deer Mouse	0.04	0	0.04	0	0.12	0	0.03	0	0.04	0	0.02	0
White-footed Mouse	0.08	0	0	0	0.02	0	0	0	0	0	0	0
Plains Harvest Mouse	0	0	0.04	0	0	0	0	0	0	0	0	0

APPENDIX E

BASELINE STATUS INDICES OF DETECTED SPECIES: BAT SURVEYS

Table E-1. Species definitively identified (Y) in a given month with acoustic recordings made on long-term passive ultrasonic bat detectors in 3 primary survey areas.

Detector	Species	Oct, 2013	Nov, 2013	Dec, 2013	Jan, 2014	Feb, 2014	Mar, 2014	Apr, 2014	May, 2014	Jun, 2014	Jul, 2014	Aug, 2014
Battle Creek, Butte County Primary Area, *Mixed Grass Prairie*	Eastern Red Bat										Y	Y
	Hoary Bat								Y	Y	Y	Y
	Silver-haired Bat								Y	Y	Y	
	Little Brown Myotis								Y	Y	Y	Y
South Moreau River Bridge, Butte County Primary Area, *Riparian Woodland*	Silver-haired Bat								Y	Y	Y	Y
	Western Small-footed Myotis								Y		Y	
	Little Brown Myotis								Y	Y	Y	Y
Jug Creek, Newell Primary Area, *Mixed Grass Prairie*	Big Brown Bat										Y	
	Hoary Bat									Y	Y	
	Silver-haired Bat								Y		Y	
	Western Small-footed Myotis									Y	Y	
	Little Brown Myotis								Y	Y	Y	Y
Bismarck Bridge, Newell Primary Area, *Riparian Woodland*	Big Brown Bat								Y	Y	Y	
	Red bat										Y	
	Hoary Bat									Y	Y	
	Silver-haired Bat							Y	Y	Y	Y	Y
	Western Small-footed Myotis							Y	Y	Y	Y	Y
	Little Brown Myotis								Y	Y	Y	Y
Fort Meade Reservoir, Fort Meade Primary Area, *Mixed Grass Prairie*	Big Brown Bat	Y						Y	Y	Y	Y	Y
	Eastern Red Bat	Y									Y	Y
	Silver-haired Bat							Y	Y			
	Western Small-footed Myotis							Y	Y	Y	Y	Y
	Little Brown Myotis	Y						Y	Y	Y	Y	Y

Table E-2. Total bat passes, number of nights bats were detected, average and range of passes for nights bats were detected each month ultrasonic detectors were deployed.

Detector Location	Date	Total No. Bat Passes	No. Nights with Detections	Average Passes Per Night (SE)	Range of Passes Per Night
Battle Creek, Butte County Primary Area, *Mixed Grass Prairie*	Oct, 2013	0	0	0 (0)	0-0
	Nov, 2013	0	0	0 (0)	0-0
	Dec, 2013	0	0	0 (0)	0-0
	Jan, 2014	0	0	0 (0)	0-0
	Feb, 2014	0	0	0 (0)	0-0
	Mar, 2014	0	0	0 (0)	0-0
	Apr, 2014	0	0	0 (0)	0-0
	May, 2014	691	23	30.0 (55.4)	1-264
	Jun, 2014	361	26	13.9 (15.4)	1-62
	Jul, 2014	421	30	14.0 (10.4)	1-54
	Aug, 2014	73	8	9.1 (6.3)	5-23
South Moreau Bridge, Butte County Primary Area, *Riparian Woodland*	Oct, 2013	0	0	0 (0)	0-0
	Nov, 2013	0	0	0 (0)	0-0
	Dec, 2013	0	0	0 (0)	0-0
	Jan, 2014	0	0	0 (0)	0-0
	Feb, 2014	0	0	0 (0)	0-0
	Mar, 2014	0	0	0 (0)	0-0
	Apr, 2014	3	1	3.00 (*)	3-3
	May, 2014	91	22	4.1 (2.5)	1-11
	Jun, 2014	67	22	3.1 (3.3)	1-16
	Jul, 2014	238	27	8.8 (6.7)	2-36
	Aug, 2014	64	8	8.0 (4.7)	3-17
Jug Creek, Newell Primary Area, *Mixed Grass Prairie*	Oct, 2013	0	0	0 (0)	0-0
	Nov, 2013	0	0	0 (0)	0-0
	Dec, 2013	0	0	0 (0)	0-0
	Jan, 2014	0	0	0 (0)	0-0
	Feb, 2014	0	0	0 (0)	0-0
	Mar, 2014	0	0	0 (0)	0-0
	Apr, 2014	0	0	0 (0)	0-0
	May, 2014	84	16	5.3 (4.6)	1-16
	Jun, 2014	168	25	6.7 (4.9)	1-19
	Jul, 2014	219	30	7.3 (5.9)	1-24
	Aug, 2014	39	8	4.9 (2.9)	1-10

Detector Location	Date	Total No. Bat Passes	No. Nights with Detections	Average Passes Per Night (SE)	Range of Passes Per Night
Bismarck Bridge, Newell Primary Area, *Riparian Woodland*	Oct, 2013	0	0	0 (0)	0-0
	Nov, 2013	0	0	0 (0)	0-0
	Dec, 2013	0	0	0 (0)	0-0
	Jan, 2014	0	0	0 (0)	0-0
	Feb, 2014	0	0	0 (0)	0-0
	Mar, 2014	0	0	0 (0)	0-0
	Apr, 2014	14	5	2.8 (1.9)	1-6
	May, 2014	313	28	11.2 (13.2)	1-66
	Jun, 2014	232	28	8.3 (4.9)	2-21
	Jul, 2014	551	32	17.2 (9.3)	2-37
	Aug, 2014	107	11	9.7 (4.0)	5-18
Fort Meade Reservoir, Fort Meade Primary Area, *Mixed Grass Prairie*	Oct, 2013	119	6	19.8 (25.7)	1-69
	Nov, 2013	18	5	3.6 (3.7)	1-10
	Dec, 2013	0	0	0 (0)	0-0
	Jan, 2014	0	0	0 (0)	0-0
	Feb, 2014	0	0	0 (0)	0-0
	Mar, 2014	0	0	0 (0)	0-0
	Apr, 2014	1,173	14	83.8 (121.6)	1-458
	May, 2014	5,616	29	193.7 (188.1)	1-698
	Jun, 2014	4,542	28	162.2 (210.5)	1-933
	Jul, 2014	6,132	31	197.8 (263.5)	17-1282
	Aug, 2014	541	11	49.2 (77.4)	1-276

Appendix F

BASELINE STATUS INDICES OF DETECTED SPECIES:

AMPHIBIAN CALLING SURVEYS

BUTTE COUNTY PRIMARY AREA

Table F-1. Proportion of points where species were detected and average estimated number of individuals at points where they were detected. Species denoted with + are BLM Sensitive.

Species	Proportion of Points Detected (N)	Average Number of Individuals Estimated at Points Detected (SE)
Boreal Chorus Frog	0.87 (34)	12.0 (17.8)
Northern Leopard Frog	0.23 (9)	1.3 (0.5)
Plains Spadefoot +	0.15 (6)	3.0 (1.3)

NEWELL PRIMARY AREA

Table F-2. Proportion of points where species were detected and average estimated number of individuals at points where they were detected.

Species	Proportion of Points Detected (N)	Average Number of Individuals Estimated at Points Detected (SE)
Boreal Chorus Frog	1.00 (12)	9.7 (8.5)

FORT MEADE PRIMARY AREA

Table F-3. Proportion of points where species were detected and average estimated number of individuals at points where they were detected.

Species	Proportion of Points Detected (N)	Average Number of Individuals Estimated at Points Detected (SE)
Boreal Chorus Frog	0.44 (8)	4.1 (2.3)
Northern Leopard Frog	0.06 (1)	2 (*)

MISSION RIDGE PRIMARY AREA

Table F-4. Proportion of points where species were detected and average estimated number of individuals at points where they were detected.

Species	Proportion of Points Detected (N)	Average Number of Individuals Estimated at Points Detected (SE)
Woodhouse's Toad	0.17 (5)	2.6 (1.1)
Boreal Chorus Frog	0.69 (20)	5.0 (4.5)

TWO RIVERS PRIMARY AREA

Table F-5. Proportion of points where species were detected and average estimated number of individuals at points where they were detected. Species denoted with + are BLM Sensitive.

Species	Proportion of Points Detected (N)	Average Number of Individuals Estimated at Points Detected (SE)
Boreal Chorus Frog	0.88 (22)	3.1 (2.1)
Great Plains Toad +	0.76 (19)	4.5 (2.6)
Woodhouse's Toad	0.32 (8)	2.8 (2.7)
Plains Spadefoot +	0.48 (12)	7.3 (5.0)